International CES

CES: Palm's Pre steals the show
Palm's Pre, a new touchscreen entry in the smartphone sweepstakes, stole the attention at last week's Consumer Electronics Show. **Page 10.**

The corporate Apple
Apple is using servers and the iPhone to slowly but surely attract enterprise users. **Page 12.**

NETWORKWORLD

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January 12, 2009 ■ Volume 26, Number 2

IT vendors eye new markets in down economy

BY NETWORK WORLD STAFF

Today's rough economy hasn't put the brakes on vendor ambition.

Microsoft aims to become a dominant player in hosted software and cloud computing in 2009, despite its late entry in these markets. Ditto for Microsoft in the virtualization arena — where early arrival VMware has some lofty goals of its own, including shooting for a bigger role in data-center management.

No less ambitious is Cisco, which is plotting a switching upgrade, blade servers for the data center and a security plan for virtualized and cloud-computing environments. Juniper Networks plans a refresh of its entire product portfolio, and Avaya will sharpen its focus on unified communications.

Read on for details about what to expect this year from these and other key IT vendors, including their most pressing 2009 priorities and potential stumbling blocks.

Microsoft sharpens services, virtualization focus

Microsoft's services push dominated its 2008 agenda, and now it's time to deliver the goods.

Industry watchers are tuned in for details on Azure, Microsoft's newly unveiled cloud operating system, as well as the first Web-based versions of popular Office applications, due this year. These play prominently in

See Crystal ball, page 20

EXCLUSIVE TEST

Cisco's ASR router: A strong first effort

BY DAVID NEWMAN, NETWORK WORLD LAB ALLIANCE

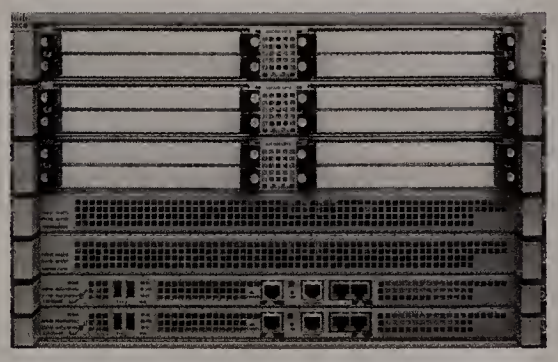
With enterprises looking to consolidate data centers and devices, Cisco's new ASR 1000 series router offers a compelling message: Do more with less.

In an exclusive *Network World* Clear Choice Test, the ASR not only moved traffic at 20Gbps but did so while running QoS, security and monitoring functions on 120 million flows from hundreds of concurrent routing sessions.

The ASR performed capably when handling multicast and IPSec VPN traffic. With a 40-core processor, the ASR has enough headroom to run firewalls and other services without requiring more hardware.

That's not to say the ASR isn't still a work in progress. Its data-plane capacity needs to grow, and Cisco hasn't rolled out all the services the ASR eventually will support. But this is a strong initial effort, well worth consideration by the many enterprises looking to replace tiers of aging 7200 and 7500

See Cisco, page 16



Exclusive test shows the ASR 1006 is fast and flexible, but Cisco still needs to expand capacity and deliver services.

NETWORKWORLD CLEAR CHOICE VIRTUAL MACHINE MANAGEMENT

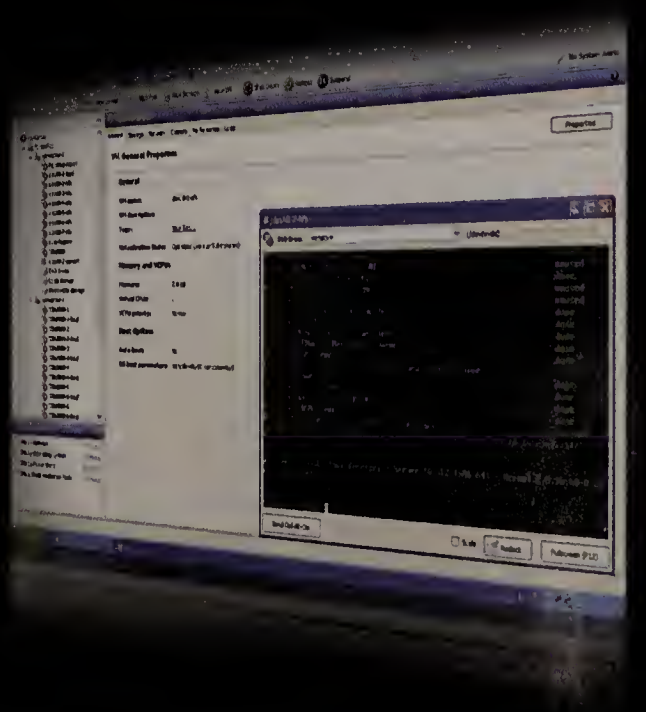
Citrix is Xen master

Top take-aways from two-tiered test:

1. Citrix XenServer tops Novell and Virtual Iron in test of Xen-based VM products.

2. Xen-based hypervisors stack up well against VMware's ESX and Microsoft's Hyper-V. **Page 28**

And go online for detailed results of Xen performance tests.
www.nwdocfinder.com/8233



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NETWORKWORLD

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TECH UPDATE

COOL TOOLS

■ **WowWee's ultraportable projector, the Cinemin Stick, was one of the many products announced at CES last week.** **See Cool Tools, page 26.**

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GOODBADUGLY

A stimulus package for you

The nonprofit Information Technology and Innovation Foundation think tank is urging Congress to devote $30 billion of the $775 billion stimulus package proposed by President-elect Obama to the IT industry, saying such a move will create or retain nearly 1 million jobs, more than half of them at small businesses.

EMC joins layoff parade

Despite expecting to meet revenue estimates for its fourth quarter, EMC says it is instituting a restructuring program that includes laying off 2,400 people. The restructuring is aimed at streamlining costs associated with EMC's Information Infrastructure business, and will not affect VMware, EMC's virtualization subsidiary, the company says. The 2,400 people represent about 7% of the Information Infrastructure business.

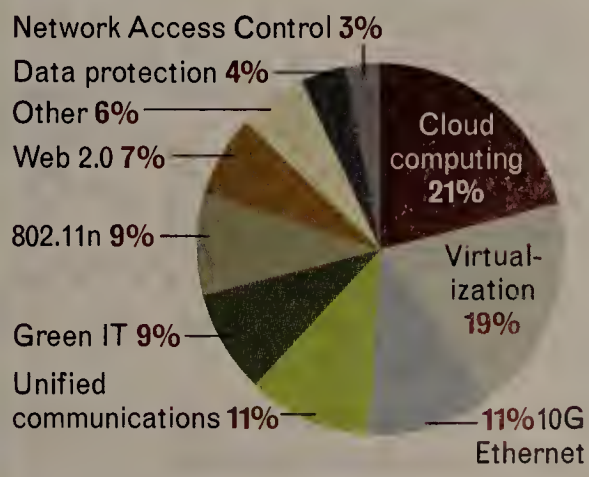
There goes some more data

More than 35 million data records were breached in 2008 in the United States, a figure that underscores the continuing difficulties in securing information, according to the Identity Theft Resource Center. The majority of the lost data was neither encrypted nor password-protected.

POLL

A snapshot of how networkworld.com visitors voted on a key networking issue last week:

Which technology will be the hottest this year?



Total voters for this poll: **159**

Vote and discuss: www.nwdocfinder.com/8243

More historical data needed

Re: Taking the art out of networking (www.nwdocfinder.com/8236):

The finite-element analysis software modeling you reference in the BoBus 888 story is only as useful as the data it receives. In real IT environments, historical network traffic data can't be gathered and modeled quickly enough to make meaningful budget numbers. Contrast this with the BoBus model though — material elasticity curves, resonant frequencies and fluid-dynamic properties for the components are well-known and quantifiable. This is the fundamental difference between the industries that arguably does make networking a bit more of an art. Ours is a very young industry; our tools and processes have not caught up with the requirements.

> "It's your responsibility to get your non-Cisco box right, not Cisco's job to troubleshoot it for you."

The biggest practical issue is coming up with quantifiable models for how the traffic behaves and will grow over time so you can build a meaningful model. At a minimum, this must be done on a per-site basis and broken out into a src/dst matrix; sometimes even within local server farms or functional silos within a particular POP. Most companies don't make this a priority until it is far too late to gather meaningful data. I think 12 months of historical data is a useful number. Furthermore, many don't have the experience in long-term protocol analysis tools and data organization to build a case that can be abstracted into yearly growth rates.

I'm in the process of building a network architecture requirements checklist, and quite honestly never thought to add historical traffic records to my list of requirements; thank you for raising this important point of network modeling.

Mike Pennington

Discuss at www.nwdocfinder.com/8236

Ah, standards

Re: Is Cisco customer advocacy being thrown under the bus? (www.nwdocfinder.com/ 8237):

The great thing about standards is that there are so many different ones to choose between. IPSec suffers from this because there are so many different options in the protocols and vendors take different approaches to meeting their particular requirements. Interoperability is better today than it was a decade ago, but it's still not perfect.

Cisco's responsibility to their users is to make sure that most Cisco platforms can talk to each other and that they have good documentation on how to set them up and which ones, if any, don't work well.

Can you do more connecting a pair of ASAs together than connecting an ASA to a $49 Linksys? Probably, and you should expect the ASA to perform faster than the Linksys.

Beyond that, Cisco should be able to tell you how to install a Cisco software VPN client on a Windows box, and maybe how to set up the standard configurations on a Linux or OpenBSD box, but it's your responsibility to get your non-Cisco box right, not Cisco's job to troubleshoot it for you.

I'm not a quadruple-CCIE, just a CCNA who's been watching crypto for a couple of decades.

Bill Stewart

Discuss at www.nwdocfinder.com/8237

No need for Internet Explorer

Re: IE lost market share, but think about it... (www.nwdocfinder.com/8238):

At work, I use Firefox exclusively — no corporately blessed ports of Internet Explorer available on Sun Solaris. At home, I now use Google Chrome almost exclusively: I keep Firefox and Safari for Windows up to date. Firefox is set to be my default browser.

When I saw the monstrous interface after I upgraded to Internet Explorer 7, I immediately stopped using Internet Explorer and haven't bothered to even try downgrading to IE6. All of the Web pages I frequently visit work just fine with Firefox, Safari for Windows or Chrome.

Mark C. Phinney

Discuss at www.nwdocfinder.com/8238

E-mail letters to jdix@nww.com or send them to John Dix, editor in chief, Network World, 492 Old Connecticut Path, Framingham, MA 01701-9002. Please include phone number and address for verification

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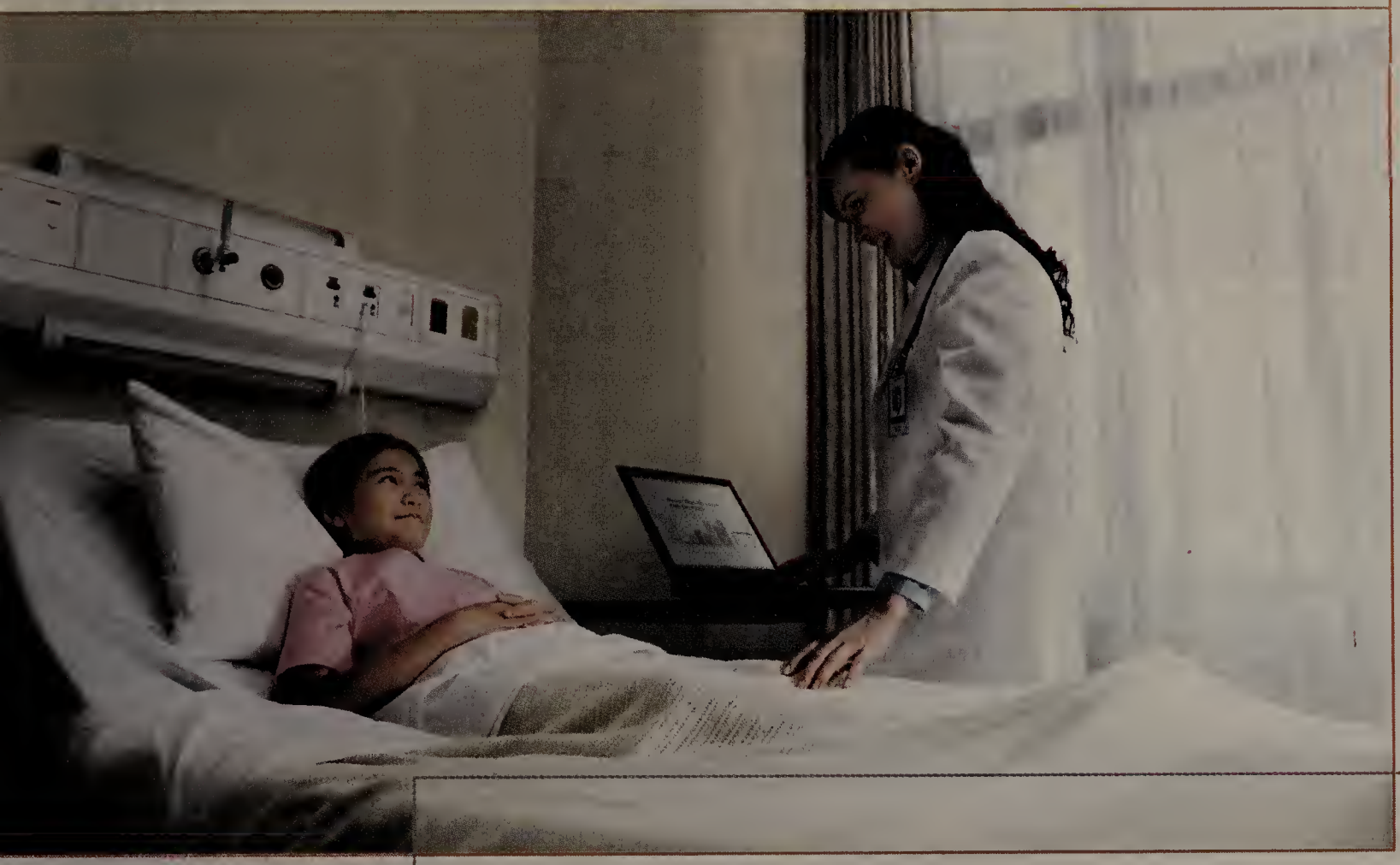

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BLOGOSPHERE

Why XP users will switch to Windows 7. Ron Barrett writes in his A Better Windows World blog, "XP users who fought so hard to protect Windows XP will finally let it go and move to Windows 7. As I said yesterday, the resistance to moving to Vista came from two very prominent components: the enhanced security (or security that actually works as some people have expressed) and the new user interface. These were the surface reasons but another, underlying reason existed as well — electronics stores were made to push Vista and soon after its release, getting a PC with Windows XP was nearly impossible." **www.nwdocfinder.com/8245**

Job prospects better for CCxP than CCIE? Wendell Odom writes in his Cisco Cert Zone blog, "Seems like most everyone these days is talking about jobs and job prospects. A friend of mine has even gotten in the habit of just asking, 'have you got a job currently?' instead of the usual innocuous greetings. So, continuing on this thread for another post or two, let me ask the following question: Are CCxPs better off in today's job market than CCIEs?" **www.nwdocfinder.com/8246**

How the yellow first-down line on football broadcasts actually works. Curt Monash writes in his A World of Bytes blog, "Fandome offers a fascinating 3-1/2-minute video explaining how the first-down line on football broadcasts actually works. Evidently, there's a lot of processing to calculate the exact location being photographed on the field, and a lot more to draw a line in exactly the right place.... Highlights include: 'Pan' and 'tilt' are measured by optical sensors right on the camera; focus and two kinds of zoom are measured by connectors to the existing digital outputs of the camera; this is all then encoded into a modem-like audio stream." **www.nwdocfinder.com/8247**

Clearwire stake could pierce Google. The Google Subnet blog reports, "Major investors in Clearwire, the new firm that plans to build the first nationwide high-speed 4G wireless broadband network, are feeling the pain of the economic downturn, big time. Time Warner and Intel both reported heavy charges due to their Clearwire stakes, as shares in the nascent firm dropped 60% in just six months. And as MarketWatch reports, that string of bad news is likely to lead to straight to another big Clearwire backer, Google." **www.nwdocfinder.com/8248**

IT VIDEO

INTERVIEWS, THE COOLEST TOOLS AND MORE

CES 2009:

Tom Hanks as gadget reviewer

During Sony's keynote at the show, Howard Stringer talked about some futuristic glasses, and the audience got an instant review from actor Tom Hanks.

www.nwdocfinder.com/8249

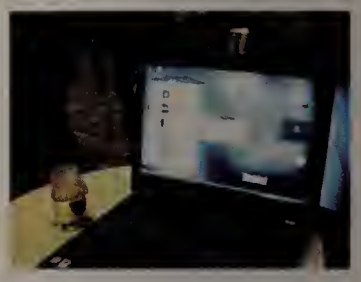
CES 2009:

Webcams go 3-D

The Webcam is standard on most computers these days, but we saw one that uses to cameras to produce a 3-D image.

www.nwdocfinder.com/8250

CES 2009:



Honey, they added a screen to my laptop

Lenovo's unique ThinkPad W700ds made its debut at CES, with its slide-out additional display.

www.nwdocfinder.com/8251

BEST OF NWW'S
NEWSLETTERS

Management must-dos in 2009

Network management: There comes a time when a nice-to-have tool evolves into a must-have technology. 2009 marks the year that several management-focused IT projects will move from the nice-to-have to the must-have column on network managers' checklists. "IT departments are going to find that mostly due to the economy, they will be forced to do many things they should have been doing all along," says Glenn O'Donnell, senior analyst with Forrester Research. "Process improvements, advanced automation and other projects will be pushed up to the top of many lists." For instance, companies once considering best practices frameworks such as ITIL could focus IT's attention on process improvements — which some say will deliver benefits without requiring capital investment. ITIL and other frameworks, such as CoBIT, Six Sigma and ISO, do require large time and staff investments, but not as many budget dollars.
www.nwdocfinder.com/8240

SMB: It's a new year, so let's make some resolutions. Sure, you do it every January and little happens, but this year will be different. This year, the tightening economy will force people to pay more attention, watch what their customers and competitors are doing, and look for an edge. Collaboration will give you that edge. You have phones in your office and in your pocket. You have texting for the phone and e-mail and instant messaging for the computers (if you can stand to thumb your phone constantly and stay at your computer all the time). But those tools are from the old days, and no longer give you an edge. Take a step back and look at how you're communicating (or not) within the company. If you're still a small company in one location, yelling down the hall may be the same as an all-hands memo. But since few small companies have a single location anymore, and even those that do need to communicate with workers at home and on the road, you'll need to be connected to something somewhere.
www.nwdocfinder.com/8241

Tech exec: Whew! The busy season for online holiday shopping has finally ended. Now it's time to analyze the results and figure out how to handle the process better for next year. No doubt one of the metrics that online retailers will be taking a hard look at is shopping-cart abandonment. According to Marketing Sherpa, 59.8% of online shoppers abandon their cart without ever making a purchase. The reasons for this vary — "I was comparison shopping," "Shipping costs were too high" — but doubts about the Web site's security certainly ranks among the top five reasons for cart abandonment.
www.nwdocfinder.com/8242

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Top 25 software errors cause most security woes

Most IT security woes, from software patching to cybercrime, can be traced to the effects of 25 software programming errors, according to a broad consensus of government and security firms. These errors include improper input validation, improper encoding or escaping of output, failure to preserve SQL query structure (SQL injection), and failure to preserve Web page structure (cross-site scripting). These are among the worst of the worst in the list of the Top 25, published this week by MITRE Corp. and The SANS Institute, participants in the Common Weakness Enumeration project organized by the Department of Homeland Security's National Cybersecurity Division. The goal of the three-year project was not only to get industry to focus on the worst software mistakes but also to provide a common vocabulary to address them in both training and tools. "This is the first serious attempt at building a taxonomy of software security weaknesses and flaws with an emphasis on practical application of identifying, preventing and fixing or mitigating the issues they pose," said Ivan Arce, CTO at Core Security Technologies. **www.nwdocfinder.com/8252**

Microsoft to kick off 2009 with single security fix. After being forced to rush out an emergency patch for its Internet Explorer browser last month, Microsoft plans to release just one security update in its first patch release of 2009. The update will be a critical fix for server and desktop versions of Windows, Microsoft said last week. It fixes at least one bug that could let attackers install unauthorized software on a victim's computer. Microsoft did not say which bugs it would be fixing, but the company has several to choose from. In the past month, Microsoft has warned of flaws in its WordPad Text Converter and SQL Server database software. One security researcher also has claimed that there is a bug in Microsoft's Windows Media Player, but the company has disputed his findings. **www.nwdocfinder.com/8253**

Obama includes broadband, smart grid in stimulus package. U.S. President-elect Barack Obama last week laid out his plan for a huge economic stimulus package, including a broadband rollout, an Internet-based smart-energy grid and computers for schools. The stimulus package could cost close to $1 trillion. The president-elect called the U.S. economic situation a "crisis unlike any we have seen in our lifetime." More needs to be done to retrofit America for a global economy, he said. "That means updating the way we get our electricity by starting to build a new smart grid that will save us money, protect our power sources from blackout or attack, and deliver clean, alternative forms of energy to every corner of our nation. It means expanding broadband lines across America, so that a small business in a rural town can connect and compete with their counterparts anywhere in the world." He also called for all U.S. medical records to be computerized within five years. **www.nwdocfinder.com/8254**

AT&T builds $23M IPv6 network for U.S. military. AT&T is building a production-quality IPv6 data network for the U.S. Army in Germany that will cost approximately $23 million. IPv6 adoption is on the rise because of network industry predictions that the Internet will run out of IPv4 addresses within three years. At that time, all backbone and corporate networks will need to support IPv6. The Army is ahead of the curve with its state-of-the-art data network, which will support its operations in Grafenwoehr, Germany — the home of the 7th Army Joint Multinational Training Center. AT&T is installing and testing a campus data network, which will support Army personnel at 600 JMTC buildings. AT&T says the installation will be complete in January 2010. **www.nwdocfinder.com/8255**

Big Skype update coming. Skype will release a big upgrade to its PC client software early next month, making videoconferencing a central feature of the new interface. The company also has released a beta version of Skype for Google Android and other Java-enabled phones, and said a version for Apple's iPhone is in the works. Skype also plans to increase its focus on business customers this year. Skype 4.0, which has been in beta for several months, will be released in early February for PC users, with an equivalent for the Mac OS due later this year, according Scott Durchslag, Skype's COO. The update includes a codec that can handle video and audio twice as efficiently as the current version, giving smoother video and clearer voice calls. Skype 4.0 will support 30-frame-per-second video for people on fast enough connections, he said. It also supports picture-in-picture, so the caller can see himself and the person he is calling. **www.nwdocfinder.com/8256**

CA to buy data-loss prevention vendor. CA last week announced an agreement to acquire for an undisclosed sum data-loss prevention vendor Orchestria, boosting the software maker's security, privacy and compliance technologies. The acquisition, expected to close by month's end, will be the third security buy for CA in as many months. Company executives say Orchestria's DLP technology will enhance CA's identity and access management products with capabilities to control access and set policies based on a user's identity and role. "CA is traditionally strong on the identity management side, but we haven't gone down to the data elements before. This acquisition is a great opportunity for CA to tie security all the way back to identity and better determine who has access to what," says Dave Hansen, general manager of CA's Security Management business unit. **www.nwdocfinder.com/8257**

Group's plan for Inauguration Day: Telework. With Washington, D.C., residents bracing for traffic gridlock and overwhelmed public transportation systems on Inauguration Day (Jan. 20), one advocacy group is encouraging employers to let their workers telecommute. The swearing-in ceremony, parade and other related events are expected to draw as many as 4 million people to Washington, which has a year-round population of about 590,000. Some organizations in Washington are giving employees the day off, but other employers don't have that option, said Cindy Auten, general manager of Telework Exchange, a group that advocates for telecommuting. If the large crowd estimates prove correct, traffic gridlock will likely continue throughout the week, with many out-of-towners staying in Washington for several days, she noted. "There are a lot of organizations in the D.C. area that can't just shut down," she said. "This is a good opportunity to try teleworking." **www.nwdocfinder.com/8258**

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CES 2009: Palm Pre leads gadget parade

Microsoft touts Windows 7 beta, other initiatives

BY JOHN FONTANA AND BRAD REED

Palm may have captured much of the Consumer Electronics Show buzz last week with its "Pre" touchscreen smartphone with a new operating system, but it was by no means the only gadget maker attracting attention.

Microsoft tried to make noise, too, with CEO Steve Ballmer taking over for Bill Gates as the featured keynote speaker. Ballmer let loose with perhaps the worst kept secret of the week — the beta release of Windows 7 — and he had little new to show in a demo that looked similar to the one at October's Professional Developers Conference.

Hidden in the glare around the client operating system, Microsoft also announced the beta of Windows Server 2008 R2, which includes the Live Migration features that have been missing from the first version of Hyper-V.

Ballmer did surprise with four announcements including the availability of Windows Live Essentials, which includes Messenger, Mail, Writer, Photo Gallery, Movie Maker, Toolbar and Family Safety. He also unveiled a deal with Facebook that connects the social-networking site and Windows Live, a partnership with Dell that will put Windows Live Essential and Live Search on Dell consumer PCs, and a partnership with Verizon that will have the mobile provider shipping Live Search on all its phones in the United States.

As for the Pre, its front is all touchscreen with a single button. It slides upwards on a slight tilt, to expose a full keyboard. But the CES demonstration was done entirely using the touch interface: no keyboard or stylus. That's due in part to what Palm dubs webOS, which the company says will provide easy access for developers.

One feature is Synergy, a synchronization program that automatically pulls contact information from sites such as Facebook, and Google, as well as Outlook, organizes it and creates a single listing in the Pre. The phone also offers a consolidated instant messaging feature from multiple IM services.

The phone supports Sprint EV-DO, Rev A, and comes with built-in Wi-Fi and Bluetooth, a micro USB port, USB mass storage support, and a 3.5mm headphone jack. The battery is removable but recharges via Touchstone, a wireless, magnetic induction charger, similar to that used for electric toothbrushes.

Aside from Palm, the big trend among gadget vendors was to create consumer electronic devices that have a smaller impact on personal space and the environment. In the former category, entertainment devices such as Samsung's 39mm Blu-ray player, Sony's VAIO Lifestyle PC and Lenovo's ultra-lean IdeaCentre A600 all-in-one desktop vied to be the thinnest devices ever released. In the latter category, such manufacturers as Motorola and Nextar are making handsets of recycled plastic bottles and solar-powered hands-free cell phone kits, respectively. Here are some highlights:

The Palm Pre generated a lot of buzz at CES last week. The touchscreen smartphone slides upwards to expose a full keyboard.

- Samsung's 39mm Blu-ray player and 7mm flatscreen: Samsung's Blu-ray player received a lot of attention at CES so far, as it measured only 39mm (or about 1.5 inches) thick and featured a slightly curved top with a shiny black finish. Not to be outdone in the thinness realm, Samsung also released a flatscreen television set that measured a mere 7mm thick.
- Motorola's MOTO W233: On the greener side of things, Motorola released the MOTO W233 Renew, a cellular phone made out of recycled water bottles and described by the company as "the world's first carbon-neutral phone." The phone, which will be available exclusively from T-Mobile, also received a CarbonFree Product Certification from the

See CES, page 38

InBrief

EMC buys parts of SourceLabs

EMC has acquired assets from SourceLabs, a maker of support and management tools for Linux and open source software. EMC's enterprise-focused cloud storage offering — a software platform called Atmos — is the focus of the acquisition, according to EMC. One of its goals with Atmos is to automate the management of huge storage volumes across wide distances, and provide auto-healing features to reduce the time administrators spend dealing with little bugs. To that end, SourceLabs maintains a repository of 16 million potential bugs in Linux and Java and offers an automated diagnostics tool that identifies the reasons behind system crashes and other problems.

Encryption top IT security initiative

IT security budgets are increasing in 2009 to consume 12.6% of the entire IT operating budget, compared with 11.7% in 2008, according to Forrester Research's survey of 942 IT and security managers in North America and Europe. Staffing and upgrades to existing security technology are taking up more than half of the IT security budgets overall. The survey also shows 20% of the available IT security funding this year is expected to go to security outsourcing, consultants and managed services, with another 18.5% targeting new security initiatives. Full-disk encryption was cited as the top client security technology to be piloted or adopted this year, along with file-level encryption. About a fifth of the organizations also said they expect to pilot or adopt data-leak prevention during the next 12 months.

Force10, Turin Networks merging

Data center switching vendor Force10 Networks is merging with Turin Networks, a provider of wireless backhaul, Carrier Ethernet and converged access systems for service providers. The merged company, which will carry the Force10 name, will have more than 1,300 customers and a product portfolio designed to serve both the enterprise and service provider markets through existing sales channels. The agreement between Force10 and Turin is another example of consolidation in the Ethernet switching marketplace as Cisco maintains its dominance and Juniper ramps up its presence in the market. Last year saw Foundry Networks merge with Brocade, and Enterasys Networks link up with Siemens Enterprise Communications.

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Where Apple stands in the enterprise

IPhone, Macs deepen reach, but broadband corporate strategy lacking

BY JON BRODKIN

Consumer products were the main focus at Apple's MacWorld Conference last week, but with powerful Macs and the iPhone, Apple slowly but surely is making progress in the enterprise technology world.

More companies are bringing Macs into their networks and increasing support for the iPhone, recent surveys show. Macs generally are pricier than Windows PCs but an increasing number of companies are letting employees choose their own desktops and many of them are choosing Macs, says Pund-IT analyst Charles King.

"We're seeing an increasing number of companies that are allowing their employees much broader latitude in the computers they use for business," King says. "Personally, I'm seeing more and more Macs on the road when I travel."

Several surveys back up King. In one report, Forrester Research chided Apple for not having an enterprise strategy, but said Mac usage among Forrester clients still has moved from 1.1% to 4.5% of desktops since October 2006,

By the numbers: Apple in the enterprise

Apple has seen a slow but steady growth in corporate computing environments.

4.5% of corporate desktops are Macs, up from 1.1% two years ago.

68% of enterprises will let users deploy Macs in the next year.

50% of enterprises will increase integration with the iPhone and other Apple consumer devices.

7,403 servers were sold by Apple in Q3 2008 for revenue of **$13 million**.

0.1%: Apple's server market share.

SOURCES: Forrester, Gartner, ITIC

"Apple's singular focus on user experience has resulted in some success in the enterprise — without even trying to break into the market," Forrester analyst Benjamin Gray wrote. The success of the iPhone is driving desktop operations professionals to seek better end-to-end experiences with the Mac, and younger tech-savvy workers are choosing Macs because they feel the Apple computers enhance productivity, he says.

Macs represent fewer than one in 20 corporate desktops, but more than two-thirds of companies responding to a survey by ITIC analyst Laura DiDio say they are likely to let users deploy Macs within the next year. Nearly one-quarter of the 700 survey participants had at least 50 Macintoshes in their organizations, she writes.

Moreover, 50% of ITIC survey respondents plan to increase integration with Apple consumer products, such as the iPhone, to give users access to corporate e-mail and other applications, DiDio writes.

When the iPhone first appeared, analysts at

See Apple, page 38

Consortium tackles cloud computing

BY JON BRODKIN

Everyone's talking about building a cloud these days. If the IT world is filled with computing clouds, however, will each one be treated as a separate island, or will open standards allow them all to interoperate?

That's one of the questions being examined by the Open Cloud Consortium (OCC), a newly formed group of universities that is trying to improve the performance of storage and computing clouds spread across geographically disparate data centers, as well as promote open frameworks that will let clouds operated by different entities work seamlessly together.

"Cloud" is certainly one of the most used buzzwords in IT today, and marketing hype from vendors at times can obscure the real technical issues being addressed by researchers such as those in the OCC.

"There's so much noise in the space that it's hard to have technical discussions sometimes," says Robert Grossman, OCC chairman and director of the Laboratory for Advanced Computing (LAC) and the National Center for Data Mining (NCDM) at the University of Illinois at Chicago.

Say you're running an application with one cloud provider, such as Amazon.com's Elastic Compute Cloud service, and want to switch to another one. "Our goal would be that you would not have to rewrite that application if you shifted the provider of cloud services," Grossman says.

The OCC wants to support development of open source software for cloud-based computing, and develop standards and interfaces for the interoperation of various types of software that support cloud computing.

OCC members include the University of Illinois, Northwestern University, Johns Hopkins University, the University of Chicago, and the California Institute for Telecommunications and Information Technology (Calit2). Cisco is the first major IT vendor to join the OCC publicly, though more could be on the way.

The consortium's key infrastructure is the Open Cloud Testbed, consisting of two racks in Chicago, one at Johns Hopkins in Baltimore and one at Calit2 in La Jolla, all joined with 10 Gigabit Ethernet connections.

Grossman and colleagues recently used the testbed to measure the performance penalty in computation over wide areas. Grossman says By using Sector and Sphere, open source software developed by the NCDM for use in storage and compute clouds, they were able to transport data about twice as fast as Hadoop, an Apache Software Foundation project, he says. One reason for the speed improvement is the use of the UDT protocol, which is designed for extremely high-speed networks and large data sets. Most cloud services use TCP, he adds.

That project won the SC08 supercomputing conference's Bandwidth Challenge Award.

"Processing data by clouds today is almost always done within a single data center due to the technical challenges of processing data across multiple data centers," a press release announcing the award states. The project "demonstrated technology . . . that enables cloud computing to utilize high-performance networks and spread cloud computing across data centers to create wide area clouds."

The OCC is just getting started, having formed in mid-2008. It is looking at the same technical issues as companies like VMware, which is developing a broad operating system that can manage the entire data center, Grossman says.

The main idea is to gather universities and IT companies in a noncompetitive way to exchange technical information, hopefully leading to cloud computing that is faster, more secure, and based on open standards and open source software.

"I'm not a marketing guy," Grossman says. "This is really trying to understand interoperability issues that I still don't think are clearly understood, and issues about how you operate clouds over wide areas."■

Network World launches new online resources

"IT Product Guides" streamline the buying process, while "Toolshed" focuses on IT tools, the latest gadgets and experts addressing tech questions

Network World this week pulled the wraps off two new Web site resources that are designed to simplify your life, keep you in the know and help you solve problems.

IT Product Guides

Our new IT Product Guides are threaded throughout the site and combine *Network World* articles and product tests with detailed vendor information about products and where they fit in. The guides cover 60 key network product areas, from routers to collaboration software to IP PBXs.

A **Quick Glance** feature shows all the participating vendors in a given product category, the market they are targeting (small to large) and how the products compare on price. Clicking on any entry in the Quick Glance grid brings up a brief product description and a link to in-depth product specifications that *Network World* has obtained from the vendors.

The **Compare Tool** feature lets buyers select the most interesting products to line up side-by-side, revealing detailed technical specifications and pricing, while the **Buying Info** tab showcases original *Network World* articles about the product category. These articles address everything from market trends to best practices, buying tips, technical primers and case studies.

Together these components, along with a news feed of the latest developments in each category, are designed to help enterprise IT buyers make informed buying decisions.

Tool Shed

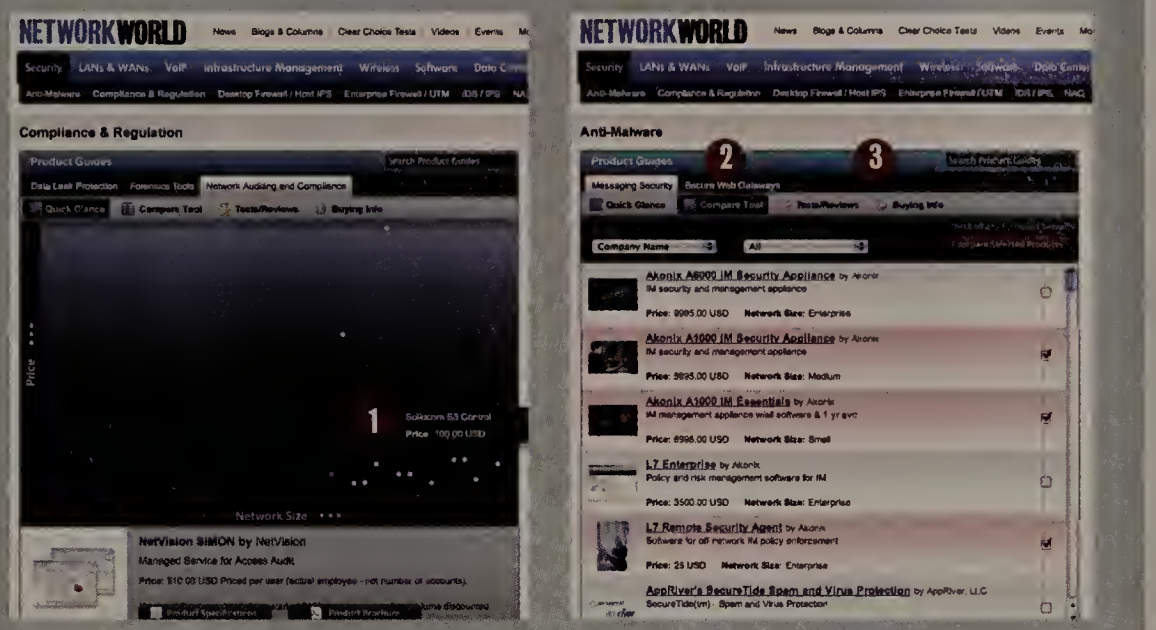
We are also proud to unveil Toolshed, a site resource that brings together:

- Reviews of **IT tools** by longtime contributor Mark Gibbs.
- Hands-on reports about the latest **gadgets** by *Network World's* Keith Shaw.
- Expert **advice** from contributors Steve Blass and Ron Nutter in what we call IT Asked & Answered. Blass, who has been working with TCP/IP networks, systems and software for almost 20 years, is an IT manager and Internet consultant in Phoenix, Ariz. Nutter, who has been in the field since the 1980's, is a network engineer on a team supporting a national network connecting over 45 offices across the county.

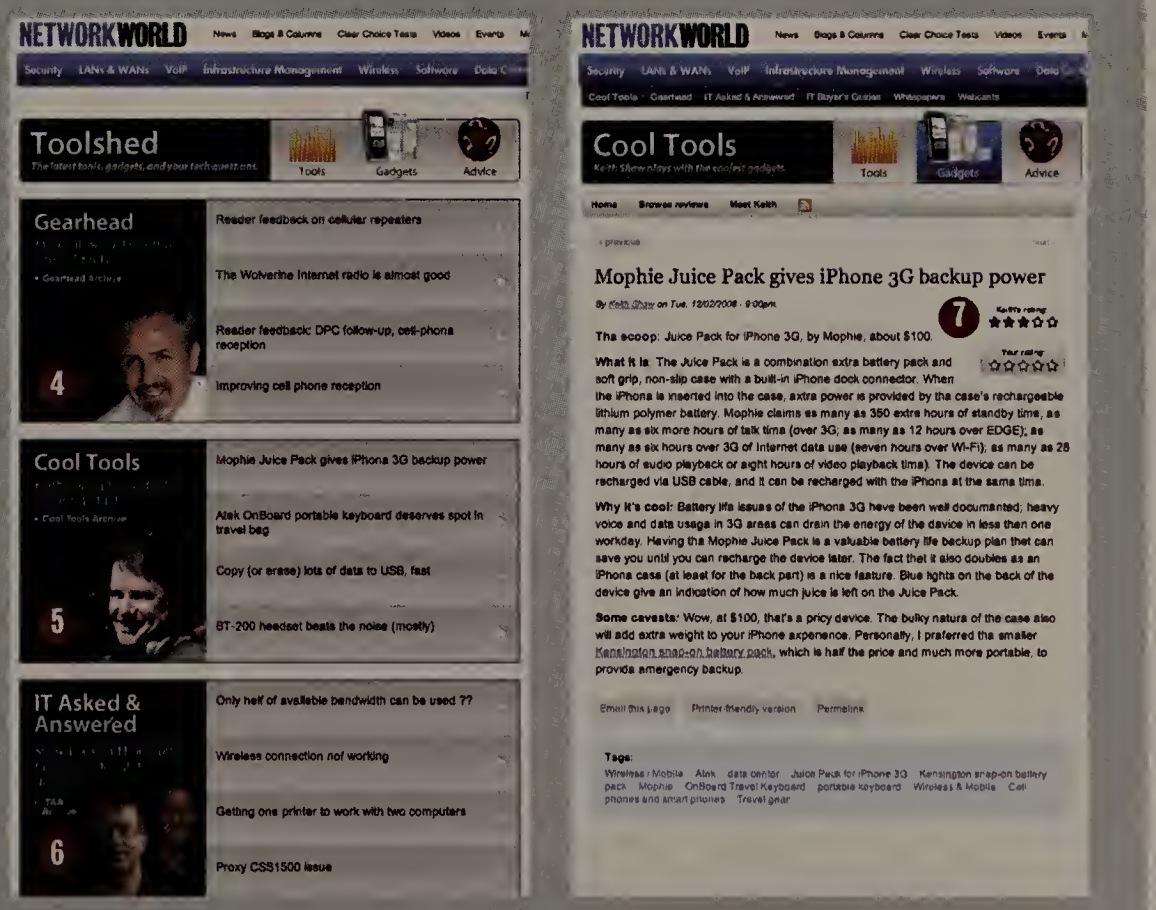
Throughout Toolshed the community is encouraged to rate the tools, gadgets and advice so you don't have to take our word about the importance of this stuff. The community also is encouraged to weigh in with their own thoughts about the material discussed and ultimately will be able post their own reviews.

Poke around in these two new areas and let us know what you think.

— John Dix (jdix@nww.com)



The new IT Product Guides cover 60 areas and offer a Quick Glance feature that shows target products on a grid (above left) with price on the Y axis and network size on the X. Clicking on any dot on the grid (1) gives summary product details and the option to access more detailed specifications or a brochure. If you want to dive deeper, you can use the Compare Tool feature (2) to analyze products side-by-side, peruse *Network World* product tests, or find articles about buying tips and market trends (3).



In Toolshed we pull together three things everyone cares about: IT tools (4), the latest high tech gadgets (5) and advice/discussion about vexing tech problems (6). All three Toolshed resources invite the community (7) to rate the items being discussed, and weigh in with their own thoughts.

On botnets, encryption, mega-worms: Security predictions for 2009

RISK & REWARD
Andreas Antonopoulos

My predictions for information security in 2009 are just predictions, not recommendations. I am trying to guess what will happen, not suggesting what should happen. As always, take these with a grain of salt.

Though these predictions are based on primary research and many discussions with CSOs, they concern information security only and can be affected by external factors that are unpredictable (at least by me). Case in point: My predictions for 2008 did not take into account a severe downturn in the economy that was underway already at the beginning of the year. Let's hope that my 2009 predictions also miss the mark by assuming a continuation of economic difficulties that turn out to be less severe. Here goes:

- Host-based security becomes the focus for 2009. The imminent release of Windows 7 and the continued interest in Mac OS and Linux as alternative desktops are once again focusing attention on operating-system and endpoint security.
- Mobile security concerns and solutions grow. The Android and iPhone platforms continue to grow, and with them comes an ecosystem of independent application developers. With mobile platforms truly becoming "platforms" for all kinds of new applications, security issues are not far behind. 2009 could be the year of the first widespread security scare on a mobile platform. Perhaps a rogue application? A Trojan?
- Encryption grows. At-rest encryption of hard drives on all desktop systems becomes the norm. Servers still lag behind. Encryption of mobile-device storage starts getting interesting. And once again in 2009, it's still impossible to send an encrypted e-mail to someone without making special arrangements in advance. Public-key infrastructure encryption remains fragmented in small disconnected islands. Ugh.
- No news is bad news. There are no new, high-profile, fast-spreading mega-worms. The world rejoices at the defeat of malware. Meanwhile super-stealthy malware spreads further than ever before, and those in the know quietly weep.
- New botnets are discovered and they're bigger than ever. The malware industry feeds the ever-increasing botnet industry. As usual, most of the innovation happens on the "other" side of the industry. Botnet makers continue to build incredible distributed, encrypted, anonymous, unbreakable command-and-control systems. Who said there are no profits to be made in 2009? If only BTNT was a publicly traded stock.
- Regulatory compliance is back with a vengeance. All the scandals and Ponzi schemes you heard about in 2008 become subtitles for new regulations in 2009 and beyond. Regulations in hedge funds, credit-default swaps and derivatives are just the beginning. A whole new industry of auditors, special software and consultants rises up to meet the challenge. You thought SOX was a pain? Just wait.
- Security projects struggle for funding. It will take a lot of arguing to get a budget for more than upkeep in 2009. But wait — regulatory compliance comes to the rescue: Use compliance to push through budget requests on everything. It's 2007 all over again!

Antonopoulos is a senior vice president and founding partner at Nemertes Research, an independent technology research firm. He can be reached at andreas@nemertes.com.

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Cisco
continued from page 1

routers with a single, more powerful system.

Introducing the ASR

ASR 1000 series hardware — which began shipping last April and was upgraded in November (see announcement blogs at www.nwdocfinder.com/8829) — has three components: an embedded service processor for data-plane traffic, a route processor for control-plane functions, and one or more line cards. The ASR family includes two-, four- and six-slot models; for this test Cisco supplied the top-of-the-line, six-slot ASR 1006 with redundant RP and ESP modules and power supplies.

The ASR's most notable new feature is its ESP module with the 40-core Quantum Flow Processor (QFP). Through separate software licenses, QFP supports numerous services, such as firewalls, NetFlow and Nbar classifiers, and — in the future — caching load balancers. The ESP module also offers powerful QoS features, with 128,000 queues and support for as many as 1,000 global policies and classification maps.

The RP module is functionally similar to Cisco 7200 routing modules, but it scales higher: a million Border Gateway Protocol routes and hundreds of thousands of Open Shortest Path First routes are possible. Scalability also extends to the number of routing sessions: Our tests involved hundreds of concurrent OSPF sessions, something we haven't been able to set up with earlier midrange Cisco routers. The RP also offers an integrated session border controller for VoIP traffic and unified communications.

ASR line cards use the same shared port adapter (SPA) design as Cisco Catalyst 7600, Cisco 12000 and CRS-1 routers, and are interchangeable among them, which should help control sparing costs. The SPA modules in turn fit into SPA interface processor (SIP) line cards.

The ASR's operating system is IOS XE, a Linux-based variant of Cisco's IOS software. XE looks and feels similar to the IOS software on 7200 routers, but it's just another process running under Linux. Unlike earlier versions where a problem with one process could crash the whole system, this modular design should help contain faults.

On the downside, the IOS XE command-line interface doesn't take advantage of powerful Unix/Linux shell features. Pattern matching of command output is limited; there's no inline configuration editing; and IOS XE does not accept IPv4 addresses entered using classless interdomain routing notation.

Unicast/multicast

We assessed the ASR with tests of unicast and multicast performance and scalability, high availability, and IPSec tunnel capacity (see "How we did it" at www.nwdocfinder.com/8230).

In unicast tests, we put an emphasis on services above and beyond simple packet blasting. In addition to enabling OSPF as the routing protocol, we configured the ASR 1006 so that each of 205 subinterfaces had two 103-line access control lists applied. On the QoS front, the routers classified and queued as many as four traffic types. We also enabled unicast reverse-path forwarding and NetFlow accounting.

Many routers and switches use NetFlow to track tens of thousands of flows at most. The previous high-water mark in tests we've done was 512,000 flows (see Cisco Nexus test at www.nwdocfinder.com/8231).

The ASR's NetFlow cache can track 2 million flows at one time. With even more flows — our tests introduced 120 million flows in as little as 12 seconds — the ASR will simply do "emergency aging" of older flows with no performance penalty. This is with full NetFlow monitoring; larger numbers of flows could be monitored using sampling techniques.

We also ran OSPF on a large scale, in terms of session count and routing-table size. Cisco configured OSPF to run on 205 subinterfaces — 20 on each of 10 1-gigabit interfaces and five on one 10-gigabit interface. In contrast, many enterprise routers run one, or at most a handful of OSPF adjacencies.

We advertised routes to 300,000 networks to the 10G Ethernet subinterfaces and 20,000 more routes on the Gigabit Ethernet side. For context, consider that the largest production OSPF networks in North America handle OSPF databases of 50,000 routes.

Even with these conditions, the ASR delivered line-rate performance with midsize and large packets (see "Tracking Cisco ASR 1006 performance numbers," page 18).

With minimum-length 64-byte Ethernet frames, the ASR's throughput topped out at around 10.4 million packets per second (mpps), or around 35% of line rate. That's slightly higher than the ESP20 module's rated capacity of 10 mpps, but this number and the line-rate numbers with midsize and large packets represent system limits.

Cisco supplied the ASR 1006 with SPAs in three of its 12 slots. Adding more ports won't increase aggregate bandwidth or packet-per-second performance, at least not with current hardware; 20Gbps throughput and 10.4 mpps is as fast as current ESP modules go. Thus, oversubscription of as much as 6:1 is possible with current line cards and ESP modules. That's not necessarily a showstopper — many enterprises never come anywhere close to fully utilizing a fully loaded ASR 1006 — but it is something to bear in mind when planning capacity.

Average unicast latency was low and consistent with small and large packets, but jumped up into the millisecond range with mid-length packets — a significant delay even in a WAN context. Cisco notes that delay is far lower (around 88 microsec) with an offered load just 1% less than the throughput rate.

When it handled multicast traffic — important for video and collaborative applications — the ASR turned in excellent numbers. In our tests, emulated hosts on 200 subinterfaces joined 200 multicast groups, each of which had 50 transmitters on one 10G Ethernet interface. Running protocol-independent multicast-sparse mode, the ASR router thus had to replicate incoming packets from 50 sources 200 times, for a total of 10,000 multicast routes.

The router forwarded multicast packets of all three sizes at line rate.

See Cisco, page 18

NETRESULTS

Product	**Cisco ASR 1006**
Vendor	Cisco www.cisco.com
Price	$250,400 as tested
Pros	Lengthy list of packet inspection and classification features; strong multicast and IPSec performer.
Cons	6:1 oversubscription with current hardware; Linux-based operating system doesn't take advantage of Unix/Linux features.
Score	**4.38**

SCORECARD

Action	Weight	
Unicast and multicast performance	25%	**4**
High availability and resiliency	25%	**4.5**
IPSec tunnel capacity	25%	**4.5**
Features	25%	**4.5**
Total score		**4.38**

Scoring key: 5: Exceptional; **4:** Very good; **3:** Average; **2:** Below average; **1:** Subpar or not available.

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Cisco
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Latency was significantly higher than that of unicast traffic, mainly because of replication and "fanout" (the number of destination interfaces). However, the multicast delay numbers are generally in line with other high-end switches and routers we've tested.

IPSec tunnel capacity

We also validated the ability of the ASR 1006 to handle 2,000 concurrent IPSec tunnels, fielding both encrypted and a mix of encrypted and cleartext traffic. We connected a pair of ASR 1006s using a Cisco Catalyst 7604 as an intermediate router. One ASR emulated a headquarters router at a large enterprise, and the other emulated 2,000 remote sites.

We offered cleartext frames from Spirent Communications' TestCenter from the remote sites bound for headquarters networks, and used a packet sniffer to verify that the ASRs put all traffic into 2,000 unique IPSec tunnels. As is common with tests of security devices, throughput was significantly lower than that of cleartext traffic alone because of the extra processing required for encryption and authentication.

Throughput for 64-, 256- and 1400-byte frames was equivalent to 14%, 41% and 81% of line rate, respectively — far lower than the line-rate results we saw for midsize and large packets in the unicast tests.

Lower crypto performance doesn't mean lower overall performance, however. We retested IPSec with a mix of encrypted and cleartext traffic. This time, aggregate throughput was essentially line rate in both directions. This suggests that enabling encryption won't cause a performance penalty for other traffic.

Cisco noted that the upgrade/downgrade times were a result of not using redundant interfaces in this test. We agree that adding redundancy would mitigate or eliminate downtime caused by SIP module software changes. In addition, we conducted the high-availability tests with 64-byte frames offered at the throughput rate; downtime would have been lower with less heavy traffic loads.

High availabilty

We assessed high-availability and resiliency features with four sets of failover and software installation tests. Because the ESP and RP modules directly handle packets, we conducted separate failover tests of each. Failover was virtually instantaneous with both: The ESP module dropped 408 packets out of more than 600 million offered, for a cutover time of 39 microsec. The RP modules failed over perfectly: They dropped zero packets in the transition from active to standby modules (see High availability chart below).

The Cisco 7200 seemed very powerful when Cisco introduced it around a decade ago, with what seemed at the time like a speedy CPU and a decadent 256MB of RAM. In the same way, the 40 cores of today's ASR 1000 seem extravagant today. Nevertheless, as enterprises look to replace their aging 7200s — and perhaps consolidate many of them onto a single, more powerful platform — the ASR 1000 series represents a promising option.

Newman is president of Network Test, an independent test lab in Westlake Village, Calif. He can be reached at dnewman@networktest.com.

Tracking Cisco ASR 1006 performance numbers

Cisco's new router proved itself a formidable replacement for the company's 7200 series in our exclusive tests, where it moved traffic at 20Gbps while running QoS, security and monitoring functions on 120 million flows from hundreds of concurrent routing sessions. It also showed itself to be a capable performer when handling multicast and IPSec VPN traffic.

Packet size (bytes)	Theoretical maximum (packets/second)	ASR throughput (packets/second)	Average latency (microsec)	Maximum latency (microsec)
UNICAST PERFORMANCE (205 OSPF SESSIONS, 320,000 ROUTES)				
64	29,761,904	10,416,667	28.17	1,235.25
256	9,057,971	9,057,971	1,159.47	3,697.46
1,518	1,624,432	1,624,432	132.95	703.66
MULTICAST PERFORMANCE (10,000 MROUTES //M ok in this word?//)				
64	74,405	74,405	847.58	2,007.84
256	22,645	22,645	859.51	2,027.21
1,518	4,064	4,064	995.9	2,270.33
IPSEC TUNNEL CAPACITY (2,000 CONCURRENT TUNNELS)				
64	14,880,952	2,083,333	115.37	173.23
256	4,528,986	1,851,384	133	181.19
1,400	812,744	712,216	187.54	216.2
64 (crypto); 1518 (cleartext, bidirectional)	3,505,635**	3,505,635**	667.9	2252.48

*Replicated to 200 subinterfaces, so forwarding rate is 200 times higher.
** Fully utilizes all available bandwidth in both directions.

Testing the ASR 1006 high-availability measure

In failover tests of the ESP and RP modules included in the ASR 1006 router we tested, failover was virtually instantaneous, with both having near-zero packet loss. In our software upgrade and downgrade tests, the time lapse is attributable to the fact that the SIP modules were not redundant.

Test case*	Theoretical maximum packets forwarded	ASR packets received	Cutover time (seconds)
ESP failover	624,995,319	624,994,911	0.000039
RP failover	3,123,828,240	3,123,828,240	0
In-service software upgrade	31,568,109,086	26,729,293,423	541.95
In-service software downgrade	31,567,036,778	27,302,385,008	477.64

*All high-availability tests run with 64-byte packets offered at throughput rate.

Thanks

Network World gratefully acknowledges the support of Spirent Communications, which made this project possible. Spirent supplied its Spirent TestCenter traffic generator/analyzer for this project; and test engineers Travis Andrews, Mark Hall, Brooks Hickman, Joshua Jansen, Steven Leventhal and Marc Pelletier offered technical support.

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Crystal ball
continued from page 1

Microsoft's battle vs. Google to attract enterprise users of online productivity applications.

Just released online versions of Exchange and SharePoint, two of Microsoft's most popular infrastructure servers, also are expected to make waves. "Exchange Online could be a sleeper product," says Peter O'Kelly, principal analyst with O'Kelly Consulting.

It will be a big year for virtualization at Microsoft, too. With its Hyper-V hypervisor firmly on IT's radar as part of Windows Server 2008, and the recession now official and reinforcing virtualization's cost-saving benefits, Microsoft will deploy a full-court press in order to make its case that Hyper-V was worth the wait.

On the desktop front, Microsoft will spend less time trying to convince people that Vista is a good operating system with a bum rap and more time moving on to the slick user-interface enhancements and IT benefits of Windows 7. Central to the effort is Steven Sinofsky, who made his name stamping out versions of Office before taking over the Windows team. Sinofsky will deliver the first feature-complete beta version of Windows 7 in early 2009, and then the industry chatter will reach a fever pitch as to its merits and whether Sinofsky can deliver a final version before year-end.

Also on tap is a new version of Office Communications Server (OCS), due to ship in February. Microsoft wants nothing less than to drive the PBX into software. With some shaky players on the traditional telecom side, including partner Nortel, the time could be ripe for a big strategic push given that OCS 2007 R2 is slated to ship with features that will eliminate the need for on-premises gateways to handle VoIP calls.

Juicy predictions

Among the slew of 2009 predictions, forecasts, musings and warnings circulating in the IT industry, here are some of the most interesting tidbits

- **IT pros turn bad:** Cybercrime will continue to escalate — and an increasing number of unemployed IT professionals will join in, predicts security vendor Finjan.
- **Cloud ambitions spur deals:** Continued growth in cloud computing will lead Google to acquire Salesforce.com or another software-as-a-service applications ecosystem — and Cisco will think about doing the same, predicts IDC.
- **Social networking unravels:** The fallout from restricted IT budgets will include the postponement or cancellation of all but the most ROI-promising social networking and Web 2.0 projects, says Vince Kellen, senior consultant at Cutter Consortium.
- **Sun gets eclipsed:** Sun Microsystems will find a new CEO to replace Jonathan Schwartz, and the company itself will be acquired or go private, asserts IDG News Service (a Network World affiliate).
- **Management market shrinks:** BMC Software or CA will be snapped up by a software vendor like Microsoft, Oracle or SAP that needs to fill out its management tool set. Another possible suitor is Cisco, which is said to be eyeing BMC's data-center automation tools for its forthcoming blade server.
- **AOL gets unloaded:** Time Warner will spin off America Online as a separate company, sell it, or use it as the basis of a joint venture formed with another company, IDG News Service predicts.

VMware eyes data-center dominance

VMware is still the top player in the hypervisor market, but this year the company will move far beyond its original focus of virtualizing x86 servers.

VMware is "no longer a virtualization company," says Forrester Research analyst Frank Gillett, who adds that VMware's current focus is providing tools that unlock the potential of virtualization, providing greater flexibility in the data center, improved disaster recovery and high availability.

VMware is banking much of its success on Virtual Datacenter Operating System (VDC-OS), a forthcoming software platform that will aggregate not only virtualized servers but also storage and network resources into one big computing pool that can then be deployed to virtual machines and applications.

Convincing enterprises that VMware deserves a commanding role in the data center will not be an easy task, however. VMware software, even the upcoming VDC-OS, manages only virtual resources. Physical servers that aren't running VMware's hypervisor are left out. Secondly, VMware manages only servers virtualized by its own hypervisor.

VMware argues that the adoption rate of Hyper-V and other hypervisors is so low that managing them is not worth expending VMware's R&D resources. "As of today, managing the other hypervisors doesn't represent a big enough market opportunity for us," says Bogomil Balkansky, VMware senior director of product marketing.

But Gillett says he's interested to see whether VMware ultimately relents and offers management tools for both virtual and physical servers, and for other hypervisors. Gillett notes that Microsoft is trying to position itself as a better alternative than VMware when it comes to interoperability.

Meanwhile, VDC-OS isn't VMware's only focus in 2009. The company also is planning to boost its desktop virtualization capabilities and roll out vCloud, which will help customers connect their own data centers to those of external providers, making cloud data centers appear as a natural extension of an enterprise's own resources.

Cisco plots blade server, security moves

Cisco's big plans for this year include delivering a "Big Bang" in switching, blade servers for the data center, high-definition TelePresence conferencing for the home, and a security plan for virtualized and cloud-computing environments.

Cisco's switching upgrade will emerge this month and encompass more than just the Catalyst 6500, as initially expected. The emphasis on Big Bang, the code name for the switching upgrade, will be green and apply to Cisco's entire switching portfolio, says Marie Hattar, vice president of network systems and security solutions at Cisco.

Meanwhile, Cisco is reportedly developing a blade server offering that will compete with IBM, HP and Dell systems deployed for years within data centers. IBM and HP have been longtime partners of Cisco, but observers say those relationships will be strained if Cisco offers its own blade server system.

Analysts say Cisco's data-center ambitions will accelerate in 2009 and underscore the company's intentions to become more of an overall IT vendor.

"Can they really make the credible transition to an IT vendor from a networking vendor?" asks Zeus Kerravala of The Yankee Group. "That is their absolute biggest challenge because that gets them into a whole different set of buying criteria."

Also on tap for 2009 from Cisco are security strategies for particular areas of data-center computing — including user endpoints, virtualized devices and network elements — as well as a broad architecture for safeguarding data centers and cloud-computing environments, Hattar says.

"I expect, in early '09, Cisco will finally articulate a cloud strategy," adds Rob Whiteley of Forrester Research. "By the end of '09 I'm expecting to see Cisco put more skin on the game with their own service offering."

Juniper redoubles enterprise efforts

Juniper plans to stay the course in 2009 —

stick hard and fast to its high-performance networking mantra, invest in areas where customers can lower total cost of ownership, and not be distracted by trendy markets such as video, collaboration and wireless LANs.

"We will spend money on making sure [customers are] secure; where they can drive TCO Nexus 7000 and Catalyst 6500 in data-center switching.

But the jury is still out on Juniper and its prospects in the enterprise.

"Juniper [needs to] establish credibility in the enterprise," Yankee Group's Kerravala says. "They are certainly credible in the security space, but in overall networking, they're a relatively new entrant in switching [and] they really don't have a very broad portfolio."

Security vendors forego "old school" ways

For security vendors, the big news in 2009 will be a shift away from traditional signature-based virus scanning as use of behavior-based detection and reputation analysis grows.

Signature-based scanning is "static, old school," says Jerry Egan, director of product management at Symantec's security technology and response division. With 12,000 new malware specimens each day to detect and eradicate, "we think that technique is reaching the end of its useful life," Egan says.

While Symantec isn't quite ready to jettison signature-based detection, the coming year is going to see a shift toward other antimalware techniques, including behavior-based protection, heuristics such as examining good and bad file characteristics, reputational analysis, and even whitelisting and blacklisting to allow or disallow code to run, Egan says.

The view about signature-based detection is not so different at Kaspersky Lab and Trend Micro.

"Our experience is that there has been a 700% increase this year over last year alone in malware," says Peter Beardmore, senior product marketing manager at Kaspersky Lab. "This is absolutely challenging the traditional approach to signatures."

Trend Micro's new approach, now in beta, is to put signature patterns "in the cloud," where they are queried by computers protected with its agent-based software.

McAfee, too, has begun a shift to cloud-based malware detection, and sees behavior-based detection as a good augmentation as well. Still, "signature-based recognition will always be part of security technologies," says Dave Marcus, director of security research and communications at McAfee.

Avaya centers on unified communications

For Avaya, 2009 could solidify the company's top spot on the UC sales charts, putting it in the best position to reap even more as the world economy improves in the years following, industry experts say.

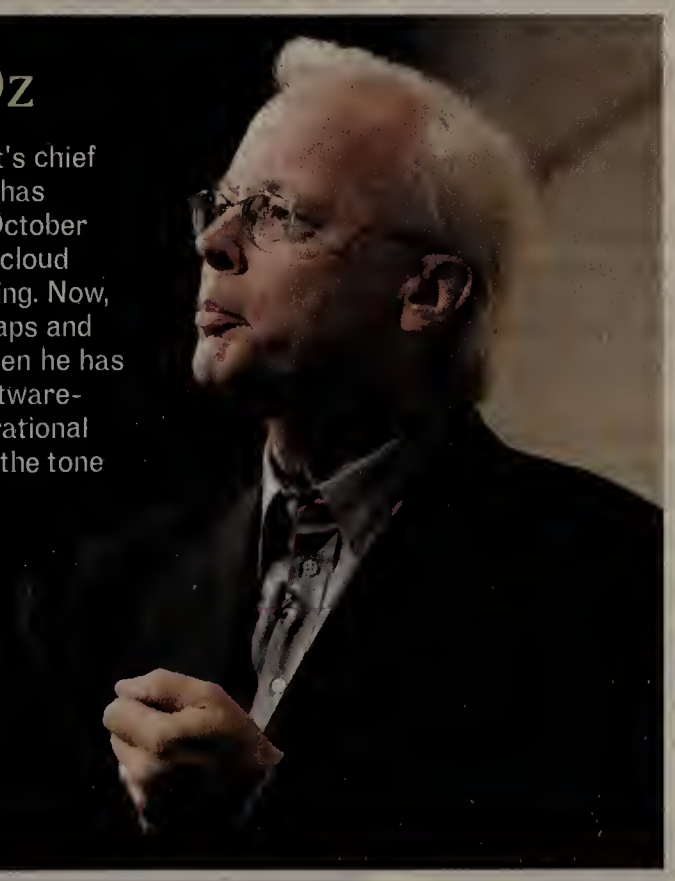
In its favor are that the company is privately held, has been at work streamlining and has installed key executives to carry out well-formed plans. The downside is that it faces formidable competitors — Alcatel-Lucent, Cisco, Nortel, Siemens, IBM, Microsoft — that are equally hungry and have different pedigrees that may give them an edge.

The company started down a new path under CEO Lou D'Ambrosio, who oversaw Avaya's purchase by Silver Lake Partners in 2007 and charted a course to overhaul it. The plan called for doing better by being more efficient internally, shifting toward indirect sales, and focusing more on software and less on hardware.

Execution of that plan has continued under interim CEO Charles Giancarlo, who replaced D'Ambrosio when he resigned for health reasons in June 2008. A permanent replacement, Kevin Kennedy, took over this month. ■

■ Read more online, including our 2009 forecasts for outsourcing and retail data security, at www.nwdocfinder.com/8239.

The wizardry of Oz



All eyes will be on Ray Ozzie, Microsoft's chief software architect, now that Bill Gates has retired. Ozzie had a winner's grin last October when he introduced Azure, Microsoft's cloud operating system two years in the making. Now, he must define the platform, fill in its gaps and convince developers to get behind it. Then he has to cement Microsoft's story around software-plus-services. It is no less than a generational shift for Microsoft, and 2009 should set the tone for Ozzie's legacy.

The CAN-SPAM Act as a warning

NET INSIDER
Scott Bradner

It is widely expected that the new Congress and administration will be passing a lot of regulations to deal with all sorts of perceived problems. It may be that the 5-year-old CAN-SPAM Act is one of the better examples of what not to do as far as regulations go.

When it was passed, the act (official name: Controlling the Assault of Non-Solicited Pornography and Marketing Act) was touted — by the politicians at least — as a tool to help control the growth of spam. Few of us in the tech world thought it would do any good, and the general feeling was that it was actually designed to legitimize unsolicited e-mail.

Back in October, *Network World's* Carolyn Duffy Marsan reviewed the legislation (see www.nwdocfinder.com/8227) and asked, "What went wrong?" Her story did a good job of covering the act and its status as a failure. It may be, however, that some important lessons were more hinted at than articulated.

The most important lesson is to not let the industry you are claiming to regulate write the regulations. The CAN-SPAM Act was written to legitimize the business of spam, and it was written to satisfy the spammers themselves. A spam-related regulation that really was aimed at providing relief for Internet users would have started with an opt-in requirement — an opt-in requirement that did not have an exemption for a theoretical previous business relationship.

The next most important lesson is to give enforcement to somebody who cares. The *Network World* story reported that as of a year ago, the Federal Trade Commission had brought about 30 law-enforcement actions. In the face of more than 100 billion spam messages per year, 30 actions barely qualify as a pinprick. It is clear that the FTC either does not care about the law or has actively decided it should ignore spam. (Along the same line, it might not be a good thing for federal regulations to override stronger state regulations.)

Yet another important lesson is that legislation should address the people who benefit from bad behavior. A far more effective antispam act would have gone after the companies using spam to advertise their wares and services, as well as the ISPs supporting the spammers.

Having an antispam act that really was designed to fight spam would not have stopped it, but in looking at what happened when McColo was taken down last November (see www.nwdocfinder.com/8228), one can see what could have happened if there had been a concerned enforcement agency and a law that went after spam supporters.

Government regulations all too frequently do far more damage than good — as the CAN-SPAN Act did. Thus it's often better not to regulate — but in view of the lessons from the banking and too many other crises, not regulating essentially is a non-option.

So, I expect the Obama crowd will have plenty of chances over the next few years to do better than CAN-SPAM. How well they do will be a good indicator of the relative strengths of the impulse to do something good for Internet users and the impulse to do something good for well-heeled lobbyists promising campaign donations.

Disclaimer: I know of no university position on the CAN-SPAM Act or on the altruism of the lobbyists who helped shape it, so the above is my own set of lessons to be learned.

Bradner is Harvard University's technology security officer. He can be reached at sob@sobco.com.

An accuracy check on last year's predictions

EYE ON THE CARRIERS
Johna Till Johnson

Seems like January 2008 was a long time ago — and maybe that's a good thing. On the bright side, a historic presidential election definitively broke the mold of "old white guys" battling it out. But then there was the global financial meltdown, the worst terrorist attack since 9/11, and across-the-board layoffs in the tech industry. Overall, most of us are pretty happy last year is over.

Here's a look at how well Eye on the Carrier was able to call some of the most significant developments of 2008.

● Bandwidth appetite skyrockets. Check. In 2008, Nemertes Research benchmarked anticipated enterprise bandwidth increases at 99% — meaning the typical enterprise telecom manager believes bandwidth requirements will essentially double over the next 12 months. Budgets are flat to declining, however, so IT execs are seeking creative ways to meet the bandwidth craving — from low-cost carrier Ethernet services to WAN optimization products.

● Unified communications takes off. I'll give myself half a point on this one. While virtually all the enterprise organizations I've worked with are assessing their UC strategies, real investment in this area will likely wait until 2009 or even 2010 (see next week's predictions). Not to get too Clintonian here, but it all comes down to the definition of "takes off."

● Hosting and outsourcing goes mainstream. Another solid hit. We've seen a dramatic uptick in the deployment of managed services (67% of folks Nemertes benchmarked say they're using some flavor of managed services). Last year I predicted: "Companies such as Equinix that capitalize on these trends are having a booming year — expect it to continue." Well, although Equinix has had a rocky year — who hasn't? — the firm ended the year fairly solidly and remains a market darling, with "outperform" ratings from financial folks like Wachovia.

● Video ratchets up. OK, this was a safe call — we've seen major enterprises ink deals with players such as Cisco and AT&T that offer telepresence solutions. But there's more to come: watch for travel restrictions to drive the use of these systems up sharply in 2009.

● Wireless data explodes. Yup. Reuters calls 2008 a "banner year" for wireless data — and virtually all my enterprise clients have seen wireless data as one of the few line items that continues to increase sharply in IT budgets. The iPhone has driven demand for — and acceptance of — high-bandwidth applications, like TV and video over wireless.

Last but not least, I predicted that 2008 would see "a wholesale reshaping of the telecom industry." I'm not sure how to rate this one. The industry certainly feels very different, with carrier Ethernet threatening MPLS' dominance, broadband wireless becoming a real alternative, and VoIP, UC and multimedia communications beginning to take off. But there hasn't been a major consolidation or change in players (other than Sprint's continued slow decline). So leaving that one aside, my performance on verifiable predictions is 4.5 out of 5 — or 90%. Not too shabby. For a peek at what's ahead in '09, stay tuned.

Johnson is president and senior founding partner at Nemertes Research, an independent technology research firm. She can be reached at johna@nemertes.com.

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Safeguarding removable-media devices

BY GIL SEVER, FOUNDER AND CEO OF SAFEND

USB flash drives, iPods and other portable storage devices are pervasive in the workplace and a real threat. They can introduce viruses or malicious code to the network and be used to store sensitive corporate information. While IT has responded with policies and audits, the best way to safeguard data taken outside of a managed environment is encryption.

If data is encrypted, it cannot be read by an unauthorized user in case of loss or theft. Most removable-media encryption products can be configured to restrict access to devices on an authorized list using the proper encryption software and the correct key. To any other computer the device appears to be unformatted and any data is inaccessible.

The first issue is to control the flow of data leaving the enterprise. A full audit of existing data flows should be conducted to ascertain who is using removable media or portable devices and for what purpose. Once that is ascertained, IT can craft a policy that defines who is permitted to transfer data to removable media and under what circumstances, and ensure the policy is properly implemented.

With that in place IT can turn to the encryption issue, which will involve evaluating the following:

- How will the encryption solution for removable media affect hard-disk encryption?
- Will there be compatibility issues with existing encryption software?
- At what level (file or folder) should removable media devices be encrypted?
- Does the solution provide platform-independent encryption?
- Can administrators override the user's password to unlock the encrypted device if the password is compromised?
- Will the encryption tool include capabilities for completely removing data from devices?

There are full-disk encryption solutions with strong user authentication that provide removable-media encryption capabilities as well as solutions that combine this with encryption functionality for applications, such as e-mail. Whichever tool you deploy the product should use AES 256-bit encryption, with or without encryption password protection.

Ideally, the product should be configured so that the removable-media policy is applied to all users. It should automatically prevent any unauthorized attempt to use a storage device, optionally alert the IT administrator and save a full audit of the attempted connection. If data transfer will be permitted, the product should be configured to make an audit copy of the data transferred.

Other capabilities a removable-media encryption product should include are:

- Authorized device access. The product should have the ability to prevent access to all devices except those that have been explicitly approved by the administrator. This mechanism can limit the size of the device used or restrict usage to devices that have been obtained from a trusted supplier.
- Access to personal devices. Any device with storage capabilities, such as a camera or iPod, is automatically denied access to corporate endpoints.
- Authorized file copy. This capability permits the user to transfer data to a device provided he has obtained permission from the system administrator. The transfer is audited and a copy of the data can be made.
- Encryption keys. For the most reliable protection, your solution should encrypt removable devices using an encryption key. Typically, each user has his own personal key, and data written to a device cannot be accessed by another user. If the user needs to share a device you can create a group encryption key and password to protect the device so that it can then be read on any machine running your encryption software.
- Existing data options. If an unencrypted device contains data, the user can opt to preserve it during device encryption. Removable-media encryption also can be configured to permit the user to save data unencrypted.
- Easy setup and implementation. The product should offer a comprehensive infrastructure that is easy to set up and can be implemented using existing active directory policies. The administrator or other users should not require weeks of consultancy or training before they can install or operate the software.

Encryption software should allow the system administrator to set permissions for each individual or user group using profiles. Whenever an employee plugs a device into an enterprise computer, the network must first authorize the device, check its content and digitally tag the device before granting access. If the removable device contains legitimate files and a rogue executable, the solution should have the option to browse the media and block access to the unsafe files.

Some encryption products support a profile approach to creating user permissions that match those on the domain controller in a Windows operating system environment. Administrators can create a guest account that grants standard rights for all guests. The encryption software enforces these policies whenever a user logs on to the virtual drive or is authenticated to use a removable media device.

Once authorized, any files transferred to the device should be fully auditable and stored centrally in a database. Audit logs should include what data was transferred, date, time, user name and a copy of the downloaded content. The audit logs can act as a further deterrent to employees from downloading sensitive information.

With the popularity of removable-media devices it is essential you implement encryption and auditing capabilities to mitigate the risk of intentional or accidental disclosure of sensitive data. Enterprises should develop a detailed data-security policy prior to making a purchasing decision.

In addition, it is wise to have an independent third-party security company examine your information security policies and encryption protocols. The company should provide an objective opinion as to the feasibility of the plan and offer insight on how to develop the appropriate security. This second opinion will confirm that the chosen security plan and policies are aligned with the company's needs.

Sever is founder and CEO of Safend (www.safend.com).

Got great ideas?

Network World is looking for great ideas for future Tech Updates. If you've got one, and want to contribute it to a future issue, contact Editor in Chief **John Dix (jdix@nww.com)**

This vendor-written tech primer has been edited by Network World to eliminate product promotion, but readers should note it will likely favor the submitter's approach.

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GEARHEAD

Mark Gibbs

Malwarebytes finds pesky Trojan

In the last Gearhead column (www.nwdocfinder.com/8235) of 2008 I discussed the weird behavior of one of my desktop machines.

This machine, running Windows XP Professional SP2, insisted on launching a windowless instance of Internet Explorer 7 that in turn was loading Flash content that I could hear but not see. The obvious conclusion was that some kind of malware was responsible, but what was it?

I had tried a few antimalware products and had attempted to pick the system apart using SysInternals Process Explorer to find the source of the weirdness, but all to no avail.

I asked for suggestions and, wow, did y'all come through! One of the first suggestions was from reader Mike Wolfe, who wrote, "There was a really nasty virus (actually five) on a friend's computer, and I was almost down to doing a complete re-image when I finally went to Microsoft Online Malware Scanning, which helped me clear the problems."

This sounded promising, so I went to the Microsoft site and of course, the service won't work with Firefox. OK, so I ran up Explorer 7, allowed it to download the scanner control and let it run — for hours. I came back the next morning, and the PC had crashed. So, I reran the Microsoft scanner, again for hours. And the next morning the PC had crashed again. This particular Microsoft technology isn't ready for prime time.

The most-recommended approach was to use Malwarebytes' Anti-Malware. Reader Joel Dunn described it as "a silver bullet."

With high hopes, I started Anti-Malware about three and half hours ago. So far, it has examined 358,320 files and found nothing. I'll leave it running overnight and we'll see if it has found anything in the morning.

Ta-da! It's bright and early, and Anti-Malware has finished its run. The scan took 4 hours, 8 minutes, 16 seconds to examine 483,040 objects (in memory processes, as well as DLLs and other disk files), and it found one infected memory process, one infected registry-data item and two infected files.

The culprit was something identified as Trojan.Agent, but I can't find a good description of what this thing does. Malwarebytes doesn't provide useful details, and other companies disagree on what the Trojan does and how it works. There's no guarantee that these antimalware vendors are referring to the same piece of code because there is no identification method or naming scheme that antimalware vendors agree on.

According to the Malwarebytes Anti-Malware log, the "infected" files were both in C:\WINDOWS\system32\. In fact the files — taskmagr.exe, which I had already spotted, and wmdmpmsvc.dll — were both files that had been added to the system rather than subverted and, as far as I can tell, appear to have contained the actual Trojan code.

I allowed Anti-Malware to quarantine the "infections" and, after a reboot, the system is running much faster, even though my old problem with unusually high processor utilization caused by deferred procedure calls (DPC) is back, this time running at around 15%.

After all this time, and with all the suggestions I've received and diagnostics I've run, the DPC issue is still unresolved. I'm thinking that it may never be resolved and a rebuild of the system is the only choice left.

The bottom line is that Malwarebytes Anti-Malware looks like the answer. The tool is free but a "full" version with real-time protection, scheduled scanning and scheduled updating is available for $24.95. I give Anti-Malware 4 out of 5. Only the lack of a detailed explanation of what it has found stops it from getting 5 out of 5.

Gibbs wrestles with digital vermin in Ventura, Calif. Got a better mousetrap? Tell gearhead@gibbs.com.

Keith Shaw

COOLTOOLS

CES remains cool despite cooling economy

You'd think the sky had fallen, with all the reports of lower attendance, shrinking hotel room rates and no Bill Gates keynote at the Consumer Electronics Show in Las Vegas. Despite the doom and gloom, there were still tons of new products announced with enough fanfare to make the hype-masters happy. Here are a couple of trends and products that piqued my interest:

Projectors get wicked small. At last year's show I got a sneak peek at the "micro-projector" or "pico-projector" concept, and this year we're starting to see products based on that concept. Nextar announced its LCOS micro-projector, the Z10, a $300 projector that uses liquid crystal on silicon technology to produce images with a resolution of up to 640-by-480 pixels, and a brightness level of 7 to 12 lumens. The 1.5-pound Z10 includes a built-in speaker and microSD card slot, and can project images as large as 20 inches.

WowWee Robotics, which usually sticks to the robotic toy market, is getting a bit more serious with its ultraportable projectors. Teaming up with Texas Instruments, the company announced its Cinemin series of micro-projectors, which utilizes TI's Digital Light Processing technology. The series includes the Cinemin Swivel (three-hour battery life, 90-degree hinge for ceiling projection), Cinemin Stick (pico projector with internal memory and expandable SD card slot), and Cinemin Station (alarm-clock-size media center and iPod docking station).

WowWee's Cinemin Stick micro-projector

These devices may be consumer-oriented at first, but it isn't much of a stretch to imagine mobile workers using these to display presentations and other videos to colleagues or sales contacts via their smartphones. We often hear talk about the "death of the notebook"; the availability of smaller projectors that work with smartphones adds to the possibility that mobile workers can forgo their laptops.

Cisco's push into the home. Cisco already has been "in the home" with its Linksys division of home wireless routers, but the company now would like to get into the living room with some new offerings. The multiroom wireless audio system looks impressive (right up there with the Sonos and Logitech offerings), but I'm more fascinated by the new Cisco by Linksys (a new branding name) Media Hub, a network-attached storage device that "gathers, organizes and presents all the digital video, photos and music that users have spread amongst various devices in the home." Starting at $300 (for the 500GB version), the Media Hub aims to search the user's home network automatically for other media devices (including PCs and notebook) and present all the available digital media to the user in a single, browser-based location. Because users probably are duplicating their media files for backup purposes, multiple versions of the same file often are displayed when it comes time to play the song or view the photo. Media Hub seems to alleviate that problem, understanding that "I just want to listen to Funkytown, I don't care where the file is located." With remote access and its own automatic backup features, Media Hub may be even more impressive as a way to show off photos instead of having to rely on online services.

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Citrix, Novell make a valid run at VMware ESX virtualization crown

Test shows Xen-based hypervisors are speedy and quite manageable

BY TOM HENDERSON AND BRENDAN ALLEN, NETWORK WORLD LAB ALLIANCE

VMware and Microsoft should be taking the competition in the server virtualization market very seriously because open source Xen-based products definitely have matured into viable enterprise-class hypervisor options.

That's what we found in our unique, two-tiered test, in which we pitted three Xen-based virtualization platforms — Citrix Systems,' Novell's and Virtual Iron Software's — against each other and against the results of our previously published test of VMware's ESX and Microsoft's Hyper-V (see www.nwdocfinder.com/8232).

The winner in our all-Xen round of testing was Citrix's XenServer, which combined solid performance and a strong overall package for those who want to virtualize Windows and Linux systems.

XenServer offered up the highest speeds in our business-transaction tests, even though it did not have a great showing in our I/O performance testing (for the complete results of our Xen-based hypervisor performance test, go to www.nwdocfinder.com/8233). XenServer's management components were flexible and easy to use, despite being a bit buggy. And its long list of supported guest operating systems adds to its overall enterprise appeal

Neither Novell's SUSE Xen or Virtual Iron should be ignored, however. We found both have plausible audiences. Novell's Xen ships as part and parcel of the company's SUSE Linux Enterprise Server (SLES) 10.2 package and Novell's overall support system is highly evolved and very responsive.

Virtual Iron's unique approach — comprising a convenient, server-farm-like approach to virtual machine (VM) guest management — provides an out-of-network administrative link that's potentially more secure than other implementations.'

In looking at the overall hypervisor landscape, VMware's ESX and

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NETRESULTS

Product	XenServer 5.0	SLES 10.2 Xen 3.2	Virtual Iron 4.4 Enterprise Edition
Vendor	Citrix Systems www.citrix.com	Novell www.novell.com	Virtual Iron www.virtualiron.com
Price	$2,000	Included in operating system price	$3,196 as tested
Pros	Fastest overall in our business transaction set; convenient configuration templates.	Good hardware compatibility; virtualization basics are included in the SLES box; strong I/O performance.	Comparatively mature platform; good management and policy controls.
Cons	Management tools contained frustrating bugs and annoying quirks; weak I/O performance.	Slower performer for Windows VM hosting; requires strong Linux skills as tested; built-in management is very basic.	Uses nonmainstream server-management backplane; older console platform lacks multitasking capability and Network File System compatibility.
Score	**3.88**	**3.0**	**3.63**

SCORECARD

Action	VMware ESX	Citrix XenServer 5.0	Virtual Iron 4.4 Enterprise Edition	Microsoft Hyper-V**	Novell SLES 10.2 Xen 3.2
Setup, compatibility and migration (25%)	4.5	**3.5**	**3.5**	3.0	**3.0***
Administration and management (25%)	4.0	**3.5**	**3.5**	3.5	**3.0***
Performance (25%)	4.5	**4.5**	**3.5**	3.5	**3.0**
Security, monitoring and event management (25%)	4.0	**4.0**	**4.0**	3.0	**3.0***
Total score	4.25	**3.88**	**3.63**	3.25	**3.0**

Scoring key: 5: Exceptional; **4:** Very good; **3:** Average; **2:** Below average; **1:** Subpar or not available.
EDITOR'S NOTE: VMware ESX and Microsoft Hyper-V scores derive from the first round of testing.
* Comparable management console wasn't reviewed because Novell didn't provide one.
** Hyper-V tested with beta of Microsoft Systems Center-Virtual Machine Manager, which was in beta at the time of testing. We are currently retesting the upgraded code.

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VirtualCenter combination still is the package to beat because of its wide compatibility list, decent performance and rich management components (see combined scorecard, page 28).

Some background

The open source Xen hypervisor originally supported only Linux machines. Today Xen can represent host hardware to almost any guest that has drivers to support the underlying hardware.

SUSE first bundled Xen in SLES 9.1, before Novell acquired SUSE in 2004. Citrix picked up its Xen capabilities when it acquired XenSource in 2007. (Listen to a podcast with Citrix virtualization CTO Simon Crosby at www.nwdocfinder.com/8221.) Novell and Citrix still contribute to the Xen project and base their products on Xen 3.2 code.

The master/slave relationship Virtual Iron establishes between its hypervisor and its guests is a different metaphor for VM hosting. It uses one or more controller servers to manage other servers running hypervisors over a private network.

To assess how these three packages measure up against the non-Xen hypervisors, we asked vendors to submit a base hypervisor package and either built-in or add-on management software roughly equal to the offerings we tested from VMware and Microsoft. Citrix and Virtual Iron complied with the request in full, but Novell would not submit its Orchestrator management application — which has a plug-in module called ZenWorks Virtual Machine Management — for review. With Novell's insistence, we tested SLES 10.2 with its virtualization building blocks but without the add-on management application.

The packages tested in this round were Novell SUSE Xen 3.2 (included with SLES 10.2), Citrix XenServer 5.0 and Virtual Iron 4.4 Extended Enterprise Edition.

The characteristics weighted heavily in this qualitative assessment were hardware and guest operating-system compatibility and the management tools provided to build new VMs, migrate existing VMs, consolidate older server instances onto new virtual ones and control all VMs for day-to-day operation (see "How we did it," at www.nwdocfinder.com/8234).

Citrix XenServer 5.0

XenServer's hardware support was second only to that in Novell's Xen implementation, which has a slight advantage because it runs on any hardware supported by the Novell SLES 10 Linux distribution.

XenServer's support for guest operating systems — the strongest such support among the Xen packages — includes Windows Server 2000, 2003 and 2008 (32- or 64-bit), Windows Vista (32-bit), Windows XP SP2 or SP3; CentOS (versions 4.5 to 5.2); Red Hat Enterprise Linux (RHEL) (versions 3.6 to 5.2); SLES versions 9 and 10 (with various service packs); and Debian's sarge and etch releases.

XenServer installs Citrix's modified version of Linux with the Xen kernel, which requires a 64-bit processor. XenServer has a simple, text-based installation routine, the console for which is useful for most post-installation tasks. We tested both the text-based and console-based XenServer management schemes, and highly recommend using the bundled (it's included in the base price, a big plus) XenCenter hypervisor-management application on a connected Windows client machine. XenCenter's templates ease the construction of new VMs tremendously. Citrix also lets the builder modify a blank template to support the installation of "generic" guest operating-system configurations.

We were frustrated by the fact that the templates didn't let us change the minimum storage values recommended by Citrix. For example, Citrix's edict is that Windows 2008 requires 24GB of storage; the only way to get around this was to delete the default/unchangeable virtual hard disk after we created it, then add another virtual hard disk with the custom storage size we desired.

XenCenter handled our ongoing management and monitoring jobs quite easily overall, but there were some minor caveats to our satisfaction.

Overall, the XenCenter interface was good (see screenshot, this page), but it still lags a bit behind VMware's: Day-to-day process flows were more easily accomplished with VirtualCenter.

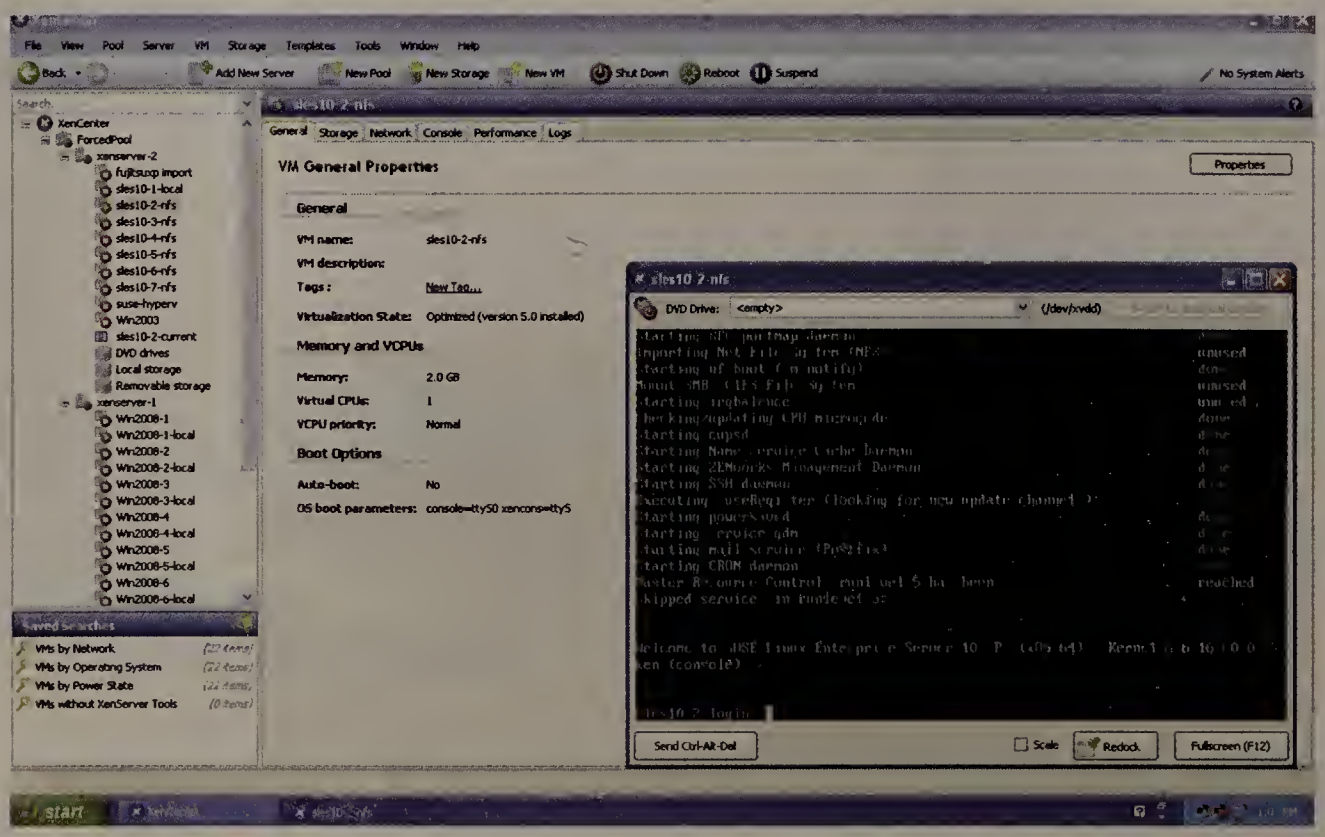
Setting up XenServer's VM monitoring facilities was very simple, because there is a list of monitored attributes (very similar to the set offered by VMware) including CPU, network usage, disk space usage, memory usage, number of CPUs per VM, hard-disk size and IP-address traffic volume. You merely have to check off what you want monitored.

XenCenter's alarms are called "alerts." We could set thresholds for anything we could monitor. If a VM reached above a certain percentage — for memory use, for example — for a set number of minutes, XenCenter would correctly trigger the alert. We also could monitor alerts manually via the GUI, under the Logs tab of each server where they're identified by the color red. The logs also rendered a detailed listing of recent events from VMs on that server.

It's possible to have alerts based on preset trigger conditions e-mailed to you (although we couldn't get that working correctly with our mail server). Mail options are frustratingly limited.

We did find some minor issues when we were moving stored VM images created under XenServer. For example, when we wanted to move a stored VM image file from local storage to shared storage on the same host machine, we had to copy the VM, then select the option to delete

See Virtualization, page 32



Citrix's XenCenter hypervisor management console — which presents a view of VMs aggregated into resource pools that allows for easy manipulation — approaches VMware's VirtualCenter in how easily it lets an administrator control guest VMs running atop XenServer.

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the original VM. This process had the undesired effect of changing the VM's Ethernet media access control (MAC) address on its network card, and you then had to change it back manually. This is not a huge issue, but it's a step that XenCenter should have taken care of for us.

Also, we couldn't copy a VM from the local storage on one machine directly to local storage on another machine. We had to put the VM into shared storage, then copy it again, an inconvenient two-step process.

We could copy or move only one VM at a time, but multiple VM-movement jobs could be queued and duly handled in turn.

Citrix's bundled XenServer has no built-in security support beyond simple password access. Because it's not hardened as a matter of policy, the password is vulnerable to dictionary attack. In addition, there is only one user — a root user, so that user can do anything, including disrupting or destroying working VMs.

Migration and consolidation patterns

XenServer uses resource pools to allow VMs to be migrated rapidly between hosts. These resource pools aggregate VM machines and resources into objects that can be manipulated as grouped-together members of the same unit.

We found strong vendor stipulations on how these work. According to XenServer's documentation, cross-hypervisor server migration is possible when "each CPU is from the same vendor (in particular, AMD-V and Intel VT CPUs cannot be mixed), each CPU is the same model (except for stepping), each CPU has the same feature flags, and all hosts are running the same version of XenServer software." These constraints make migrating VMs more difficult in an environment that lacks identical hardware and certainly more onerous than any other restrictions put in place by other hypervisor vendors.

Citrix also offers XenServer Live Migration, which is the ability to move a VM from one host to another without the VMs' losing (much) availability. As long as we stuck with VMs in the same resource pool, this feature worked well. Migration was fairly quick, removing active VM availability for only a few seconds at most.

VM snapshots, while missing from the GUI, are available via the command line. Snapshots in XenServer don't seem to work in the same way that other hypervisors' VM snapshots do. XenServer's snapshot process just creates a template for the VM. With other vendors' snapshots, we created a kind of hierarchy of iterative snapshot files and reverted to any point in the hierarchy to capture the desired time-stamped snapshot.

Consolidation requires P2V tools

A physical-to-virtual (P2V) maneuver takes a working server's operating system, applications and stored data, and converts it to a VM without anything having to be reinstalled from scratch on the virtualized host system. P2V is a useful and necessary process for corporations looking to virtualize existing data center servers — whether they are Windows or Linux ones. Without P2V tools, building a VM entails installing the server operating system, then installing applications, then migrating the existing data to the new host.

Citrix offers separate P2V utilities for Linux and Windows servers. XenServer's Linux P2V application is included on the XenServer installation CD. You must boot from the machine using this CD if you want to convert a physical Linux machine to a VM.

We had issues with this tool during testing. Our server was running SLES 10.2, but the Citrix utility couldn't detect the operating system on that server. We were able to "start" a P2V of an SLES 9 32-bit installation, (although it mistakenly identified it as Red Hat 3), but it failed with a generic failure "error 500." We tried again with an AMD64 machine with Ubuntu running on it, but the application still showed no supported operating systems and wouldn't let us proceed with making a P2V of the Ubuntu image.

The second Citrix P2V utility is called XenConvert on Windows, which takes a Windows operating system and its applications, then turns the combination into a VHD or XVA file to import to XenServer to run as a VM. That said, the process failed with one Windows XP machine in the test bed. XenConvert consistently gave us an error message each time we attempted the process. A second Windows XP test machine could be converted, but the boot loader (grub) was mangled and the new XP guest instance wouldn't load. We had to fix the grub configuration to make it work.

Citrix's P2V tools may work for versions of Windows and Linux we did not test, but we were certainly dismayed at the lack of success in testing.

Novell SLES 10.2 with Xen 3.2

Novell's SLES 10.2 including Xen 3.2 is part of its Linux product line and typically is managed by the company's ZenWorks products and services. However, Novell refused to supply its Orchestrator management platform with a ZenWorks virtualization management module for this review, stating that Orchestrator is customized for each data center deployment via Novell Consulting Services and, therefore is not an appropriate product to be included in lab-based reviews. Therefore, our assessment of Novell's offering rides solely on the SLES 10.2 Xen implementation and the tools bundled with it.

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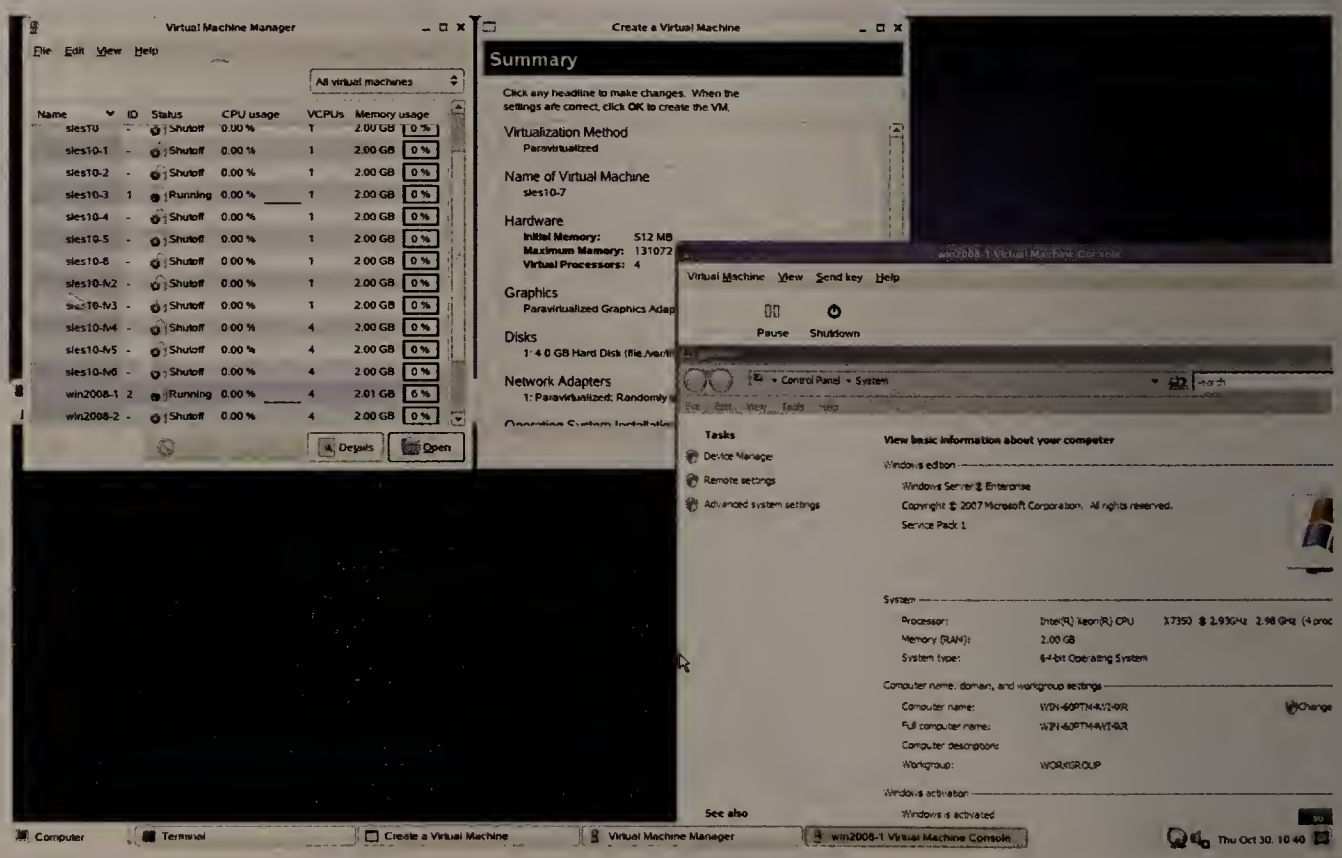

Novell's SLES 10.2 Xen implementation in our test was managed by a combination of shell scripts and an open source GUI tool called Virt-Manager (the open source Virtual Machine Manager, not to be confused with Microsoft's tool of the same name) in lieu of having Novell's Orchestrator, which the company opted not to submit for testing. Unix lovers will feel at home with these tools.

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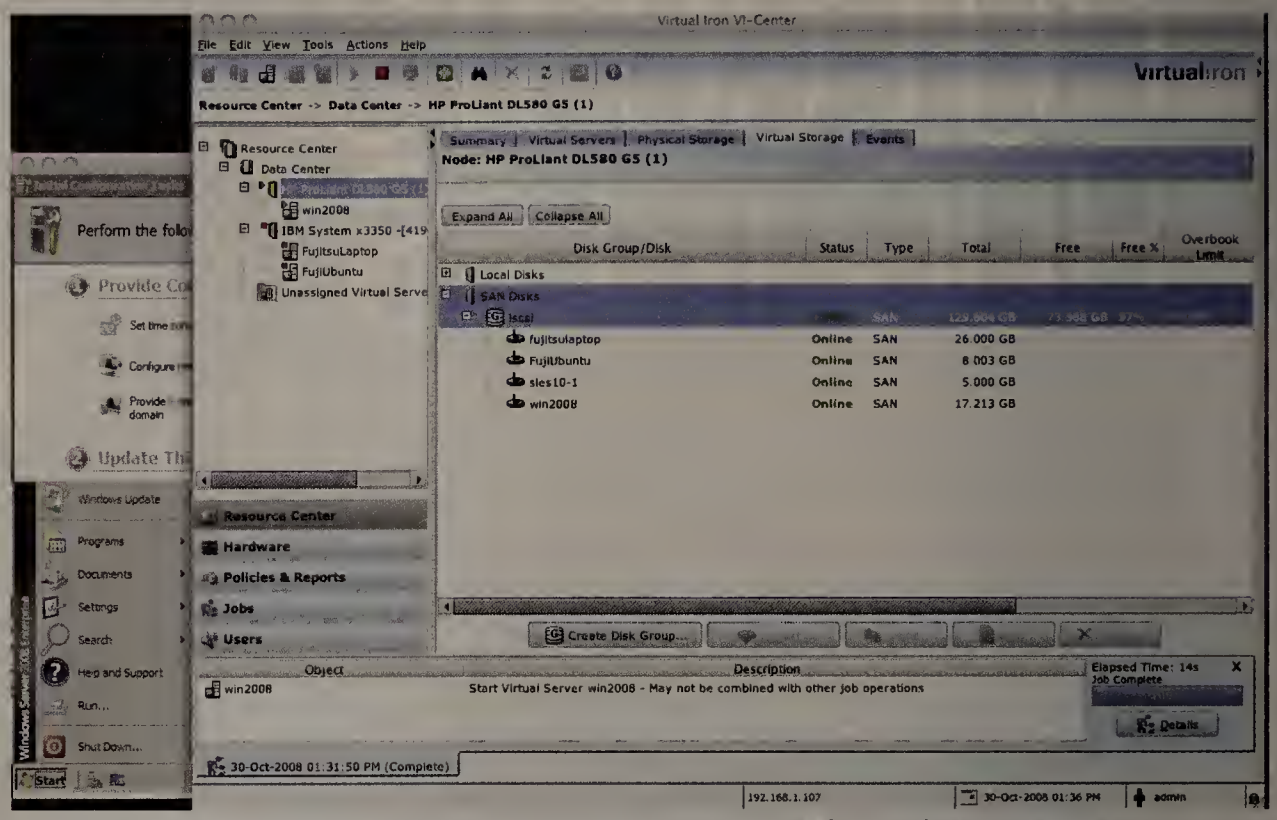
In terms of compatibility, Novell's Xen supports everything that the x64 version of SLES 10.2 does. This list of supported server hardware foundations (see www.nwdocfinder.com/8222) is the best of the three Xen competitors. The list of the guest operating systems it supports, however, is narrower than both Virtual Iron's and Citrix XenServer's. The Novell list includes paravirtualized SLES 10, NetWare 6.5, Microsoft Windows Server 2008, fully virtualized Windows 2000, 2003, XP, fully virtualized SLES 9, and RHEL versions 4 and 5. Missing from this list are Windows Vista and CentOS versions.

The initial installation of Novell's SLES Xen is exactly the same as the installation of SLES 10.2 (www.nwdocfinder.com/8221), with the sole variation being the installation of precompiled Xen kernel. We implemented the 64-bit Xen kernel, but there also is a 32-bit kernel available from Novell.



Virtual Iron's VI-Center management console takes a Microsoft Management Console–like approach to resource administration tasks, but VI-Center dictates that administrators must usually perform these tasks slowly and sequentially.

Two GUI applications are available with Novell's Xen bundle, which we used to facilitate installation. The vm-install tool provides a templated VM creation method that's somewhat similar to Citrix's XenServer templates. We used setup utilities familiar to us from our long history with SLES versions for networking and shared storage. VMs we created could be paravirtualized (usually Linux guests only) or fully virtualized Windows guests.

Novell's SLES Xen package includes a rudimentary virtualization application called Virt-Manager (short for Virtual Machine Manager, not to be confused with the Microsoft tool of the same name) — a common, lightweight GUI application included in Xen-based virtualization products. Virt-manager has an option called Create Virtual Machines, which we invoked before installing Windows and SLES as guest machines. Then we set up each VM's allocation of RAM, CPUs, hard disk and networking, and selected whether we wanted the guest to be paravirtualized or fully virtualized. If a VM will be connected to shared storage, that storage needs to be set up as a directory beforehand. This includes iSCSI or Network File System (NFS) shares used for VM storage managed from the SLES installation; they're more difficult to allocate post-installation.

We performed simple day-to-day management tasks primarily via a single command-line-interface command called "xm" and a series of shells built around it that let us complete ongoing VM management. Xm lets you destroy, pause, reboot, shut down and save a VM's guest state.

Novell supplies a script called "xmclone.sh" that creates a copy of a VM. We found it straightforward and simple to use. The only problem with this process is that it can copy instances only to the same server — not to another virtual host. To move the image to another machine, we had to move the VM snapshots we took to shared storage manually.

Xm also does basic monitoring, and shows uptime, real-time state, configuration and CPU information. Through xm, you can change memory-use boundaries and the number of virtual CPUs available within domains.

From the xm command line, you also can read logs and do troubleshooting. For example, we could view the message buffer logs using the xm-dmesg command to peek at the logs during various phases of testing.

Reconfiguring network connections for VMs with Novell's tools was tedious. Because it uses a virtual network adapter, making changes to network settings required that we boot a non-Xen kernel, then reboot back into Xen.

Novell SLES Xen had no alarms, events or Xen-specific reports — just those that can be found in SLES 10.2, which aren't useful for VM monitoring or alarm management.

SLES 10.2 Xen had one unique management feature among competitors in that it let us change the number of CPUs allocated to a VM while the VM is running (if it is paravirtualized). We found this ability to reallocate CPU muscle to an application to be useful.

Novell's SLES 10.2 Xen uses native security and password-access policies, which are chosen as the default security for the overall operating system. Directory-access user security is enforced via SUSE's native supported APIs (LDAP, Kerberos). SUSE Xen supports access via Secure Shell or a certificate. As with Virtual Iron, there are no restrictions placed on users in SLES 10.2 Xen to let them start or stop VMs.

Consolidation and migration

Novell's SLES Xen does not have a P2V tool in its bundle. PlateSpin is a Novell company, however, so that's a P2V option at a price, and Novell did not include it in the tested bundle. Virtual Iron OEMs the technology, however, and we tested it as part of that package.

The general SLES 10.2 Xen migration processes worked in our testing only for active paravirtualized guests. It doesn't work if the VM is fully virtualized or turned off, capabilities that competing Xen implementations can carry out. Another snag in Novell's migration pattern is that a VM migration via iSCSI was only temporary; it did not stick to the new machine if we rebooted or shut it down.

Snapshots (called checkpoints here) are also available with the Novell implementation via a command-line string: - xm save -c <domain> <checkpoint file>. If we used the -c option, the server continued running (temporarily pausing, however). If we performed a save, the VM was halted. We could then resume from the previously set checkpoint using the xm restore <checkpointfile> command.

Novell's SLES 10.2 Xen has great promise for a number of applications

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that require virtualization, and its value as a member of the normal SLES 10.2 "box" gives it high value, absent Novell's Orchestrator. Linux-savvy administrators can certainly make Novell's Xen work for them.

Virtual Iron 4.4 Enterprise Edition

Philosophically speaking, Virtual Iron is different from the other hypervisors tested because it sets up a hypervisor server farm that is managed through a direct-control application over a private link. The Virtual Iron 4.4 Enterprise Edition we tested requires a separate physical machine used as a management server. In turn, this server controls what Virtual Iron calls nodes — 64-bit hypervisor VM-hosting servers. The VMs running on top of these nodes are still referred to as guests.

Virtual Iron uses a master/slave configuration where servers use Preboot eXecution Environment (PxE) boot mechanisms to start their initial program loading, and then they become substrates for virtualization. This means that Virtual Iron slave servers have two networks, a public one that faces the world and a private network used for communication with the master (a machine where Virtual Iron's management application, the VI-Center console, is running).

Virtual Iron platform support has two considerations, one for the Virtual Iron VI-Center and the other for managed nodes.

The VI-Center must be installed on a machine with RHEL 4 (32- or 64-bit), Windows 2003 (32-bit), or SLES 9 (32- or 64-bit) — all of which are older versions of these operating systems. To use VI-Center, we also needed to have Java 1.5.0 installed on this machine.

As for the managed nodes, you need at least 2GB of RAM, an Intel-VT or AMD-V processor, either SATA or SCSI drives, and at least two Ethernet ports. A full listing of the hardware supported can be found on Virtual Iron's Web site (www.nwdocfinder.com/8225).

The guest operating systems supported include RHEL 3 and RHEL 4 and 5 (32- and 64-bit); SLES 9 and 10 (32- and 64-bit); CentOS 4 and 5 (32- and 64-bit); Windows Server 2000; Windows XP; and Windows Server 2003, 2008 and Vista (32- and 64-bit). All must run fully virtualized because the Virtual Iron hypervisor does not support paravirtualization..

Like Citrix's XenServer, Virtual Iron's Java-based management tools are included with the license. Although we didn't run into as many configuration errors as we did in our testing of XenServer, we did have our share of difficulties using Virtual Iron's Java-based GUI.

To get the Virtual Iron installation off the ground, we had to create a data center — basically an object in which the nodes are virtually held and from which they are managed. In turn, the nodes use PxE methods to boot, find the Java-based management server and take directions from it. You also use VI-Center to build and provision new VMs that will reside on each node.

We attempted to set up shared storage between nodes, but were unable to use NFS because it's not supported. So, we moved on to iSCSI connections. To set up iSCSI, we had to create a new network within the GUI and check the iSCSI box — which then takes up another server Ethernet port. Luckily, we could still use that same network link for connecting to the Internet or the LAN for our VMs, although the company doesn't support this because it's likely to clog the port with a combination of network or SCSI-targeted data communication. Using Virtual Iron's recommended construction, we occasionally lost iSCSI links.

We also tested an interesting and unique Wake-on-LAN feature to manage Virtual Iron nodes remotely. It worked quite well and is useful for remote management tasks.

Operating and monitoring VM guests

Once we had Virtual Iron 4.4 and VI-Center in place, we were able to move, copy and migrate VMs in sequential operations. Each new cloning job had to wait until the previous one finished: VI-Center locks out other processes from executing while one is processing. We saw this take place when we were creating storage components and ISO images and starting VMs. VI-Center messages said, "This may not be combined with other job operations."

Cloning VMs didn't take very long, depending on the size of the VM. We couldn't choose a name for a cloned server at the time of cloning, however (it will just default to "Copy of VM ..."), which seems odd. We had to rename images manually afterwards.

Virtual Iron 4.4 supports a Live Migration feature as well. Once we set up our disk channels (iSCSI and Fibre Channel, an untested option), we could drag and drop VMs between the nodes to do a VM Live Migration from one Virtual Iron host to another. The GUI doesn't make it obvious or easy, but it works.

Snapshots included in the Virtual Iron package worked well in testing generally. We found a bug in the process, however, in that storing a snapshot, then reloading a VM from a stored snapshot changes the MAC address of the snapshot VM's Ethernet adapter. This sets off a cascade that affects SUSE Linux guests, which key on MAC addresses, forcing a reconfiguration of a SLES 10.2 guest's network information. We reported this to Virtual Iron and were informed it was a known bug.

For ongoing VM management, we could use the VI-Center GUI to view dashboard-like information regarding the amount of VM RAM being used, the CPU utilization, and the number of VMs started or stopped (see screenshot, page 34). This is similar to the level of monitoring offered by the other hypervisors.

Policies, which act like the other hypervisors' alarms but also offer corrective actions in some cases, are included in the Virtual Iron offering. There are a limited number of built-in policies of three basic types: user policies, reports and system policies. We could edit and customize these, but there doesn't seem to be a way to create a new policy.

Among the user policies are EmailNotifier, which sends you an e-mail when an event happens; and SystemBackup, which backs up the database. This backup policy came in handy a couple of times when the database became corrupted and we had to restore from a backup. The system policies include AutoRecovery (a feature that moves VMs to another node if their primary node goes down) and LiveCapacity (which moves VMs depending on resource usage). With reports, you get detailed information about events, jobs, nodes, or virtual disks or servers. You can customize these reports and save a copy.

Virtual Iron let us use Lightweight Directory Access Protocol (LDAP)-based authenticated directory-services credentials to log on to hypervisors; the hypervisor's security therefore is only as strong as the foundational directory service. We also could use administrator-added Virtual Iron-specific users for tracking purposes, but there wasn't a good reason beyond logging to do so.

The Virtual Iron 4.4 Enterprise Edition we tested includes a license for Virtual Iron LiveConvert, which is an OEM version of Novell's PlateSpin P2V tool. To use it, we needed an extra server with Windows 2003 Server (the platform we tested on) or Windows 2000 Server installed that could host Microsoft's SQL Server, which LiveConvert uses. In our testing we could convert only Windows XP machines because Linux and Windows 2008 are not supported yet.

Summary

Were we to pick one on a price-is-no-object basis, VMware still leads in overall performance, but Citrix XenServer's transactional performance and burgeoning management qualities make it a great value, if not quite as robust.

Virtual Iron 4.4 is appealing to system designers who like the ease of PxE media provisioning and isolated VM-farm backplane communications infrastructure as a subsystem. Also, we can't dismiss Novell's SLES 10.2, because it impressed us with what we could see. It worked well and consistently without any weird quality-assurance issues like the ones we saw with Citrix's implementation.

The good news is that there are certainly a number of viable choices for hypervisor platforms. Competition hopefully will breed excellence in future releases of these products.

Henderson and Allen are researchers for ExtremeLabs in Indianapolis. Contact them at kitchen-sink@extremelabs.com.

CES
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CarbonFund.org, a nonprofit Web site that specializes in helping companies create carbon-neutral products.

● Nextar's NXBT-001 and NXBT-002 solar-powered cell phone kits: While there are lots of hands-free, Bluetooth-enabled cell phone car kits out there, Nextar is hoping that its NXBT kits make a name for themselves by offering users a solar-powered alternative to plugging their kits into their cars. Nextar says the NXBT-001 offers 10 hours of talk time when it is fully charged, while the NXBT-002 offers six hours of talk time when fully charged. The kits also utilize Bluetooth 2.0 technology to give users talk range of as much as 30 feet, the company says.

● Sony's VAIO laptop and "Eco" Bravia televisions: Sony decided to unwrap products this year that were equal parts slim and green, including its 8-inch, 1.4-pound VAIO Lifestyle PC and its "eco-friendly" Bravia VE5 television models. The VAIO P Series computers feature built-in 3G capabilities, as well as 802.11n, Bluetooth and GPS functionality. The laptop also is powered by the Intel Z520 Atom processor. The Bravia VE5 TVs have zero-watt standby power switches that Sony says enables them "to reduce power consumption by almost 40% compared to... other LCD HDTV models."

● The HP Mini 2140: What makes the Mini so intriguing is its long battery life —according to HP, it can run eight hours between charges. The company says by using a six-cell battery in tandem with Intel's Atom processor, its Mini 2140 will easily outlast the battery power offered by its competitors. The computer also has a 10.1-inch display screen, a hard drive that offers up to 80GB and a QWERTY keyboard that is about 92% the size of a standard one.

● MSI's Wind NetOn all-in-one PC: MSI is upping the ante in its competition with Asus by debuting its Wind NetOn all-in-one PC. It features a touchscreen display and is powered by Intel's dual-core Atom processor, which happens to be the same processor that the HP Mini 2140 uses to significantly extend its battery life. The Wind NetOn comes in two models, one with a 19-inch display and one with a 22-inch display.

Network World Senior Editor John Cox contributed to this story.

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ited "virtual" university. It beamed courses via satellite to the likes of IBM, HP and Motorola.

21. Voilà! BB84 QUANTUM cryptography: Charles Bennett and Gilles Brassard developed the first quantum cryptography protocol.

22. 'Looks like a ROBOTICIDE, captain": On July 21 in Jackson, Mich., the nation's first fatal robotics accident killed a 34-year-old diecast operator.

23. Out for a SPACE walk: Shuttle Challenger astronaut Bruce McCandless became the first to fly in space with neither a craft nor lifeline.

24: "The TERMINATOR": Now *that's* network trouble: Kyle Reese: "Defense network computers ... decided our fate in a microsecond: extermination."

25. TRANSFORMERS grow up, too: That's right, Hasbro's robots in disguise have been more than meets the eye since 1984.

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Apple
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Gartner warned enterprises that the device lacked crucial security features and support for widely used e-mail systems, such as Microsoft Exchange.

Pund-IT's King says he's not convinced the iPhone offers more productivity benefits than the BlackBerry, but says concerns about merging the iPhone with existing e-mail systems seem to have disappeared.

Forrester predicts that 10% of small-to-mid-size businesses (SMB) will deploy iPhones in 2009, but adoption won't be as strong among large enterprises, which have stricter IT requirements.

"Now that the iPhone 3G supports Microsoft Exchange ActiveSync, push e-mail, contacts and calendar, and can be remotely wiped if lost or stolen, it does indeed address key business mobility requirements," Forrester analyst Michele Pelino writes. "As a result, we believe that the iPhone will make a more significant dent in the enterprise mobility market, primarily among SMBs, which typically don't have as strict IT requirements as large enterprises or widespread line-of-business application deployments."

Apple has not been as successful with its line-of-business servers, including the Mac OS X Server, the Mac Pro and Xserve. Apple's server-revenue market share was one-tenth of one percent in the third quarter of 2008, with revenue of $13 million on 7,403 server shipments, according to Gartner. The number of Apple shipments was higher than in 2007 but revenue still dropped slightly.

Apple recently lured server expert Mark Papermaster away from IBM, where he had worked for 26 years and was the company's top official working on Power microprocessors and the vice president of IBM's blade server development unit. IBM sued Apple to block it from hiring Papermaster, saying he had signed a noncompetition agreement and that Apple competes against IBM in developing servers, PCs and microprocessors.

The case is still working its way through court, but Apple says it hired Papermaster not to help it develop better servers but to lead engineering for iPods and iPhones. Apple may want to tap Papermaster's market and partnering expertise to broaden the reach of the iPhone further into the enterprise, says Gartner analyst Jeffrey Hewitt.

Apple has made multiple attempts over the years to penetrate the server market, but with limited success, says Forrester analyst James Staten. The servers are attractive for such needs as video and photo editing and publishing, and video game development, he says. IT folks who use Mac desktops already sometimes want a "Mac-like server" that's easy to use and install, Hewitt adds.

Although Apple servers are competitive in terms of horsepower they don't meet typical enterprise standards, according to Staten, who notes a lack of integration with remote management tools that make it easier to identify failures and potential fixes. "It's a big leap to assume an Apple would be able to become a Tier 1 server provider," he says. ■

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BACKSPIN

Mark Gibbs

COBOL and governmental efficiencies

Welcome to a new year. 2008 saw our 401(k)s become 201(k)s, our worries about the price of gas come and go, our house values plummet, our economy implode and our IT budgets shrink. It was not a good year.

Will 2009 be better? Well, at least we have a new administration about to take office, and the transition already looks orders of magnitude more organized and, dare I say it, more professional than the last four administrations.

One of President-elect Obama's recent appointments was to a new post, chief performance officer, and the lucky victim, er, office holder is Nancy Killefer, who has impressive credentials. The CPO's job will be to increase governmental efficiencies and eliminate wasteful spending. This is not a job for the faint of heart.

When he announced Killefer's appointment, Obama said, "We can no longer afford to sustain the old ways when we know there are new and more efficient ways of getting the job done." Never were truer words spoken, and government IT operations have to be a central concern.

The reason for this is that government IT has been extremely conservative. Consider COBOL — most of us probably think it's already dead, but no so fast. For all the advances we've had in programming languages and techniques over many decades, it turns out COBOL won't be pushing up daisies any time soon, particularly in the government sector. According to COBOL purveyor Micro Focus, COBOL programs today process 75% of the world's business data and around 90% of all financial transactions.

Take a look at California. As part of his efforts to cure the state's appalling budget deficit, Gov. Arnold Schwarzenegger demanded state workers be paid on a minimum-wage basis, but was told by state controller John Chiang that no such thing was about to happen.

This was not some kind of disobedience on Chiang's part, but rather a result of the state's having a payroll system written entirely in COBOL. To save money, California had laid off all temporary and part-time workers, including a lot of consultants. You guessed it: The only people who know COBOL are the consultants. And even if they were still employed by the state, you don't change COBOL installations the size of California's payroll system in weeks or even months. California has been trying to revamp its payroll system for a decade, and it is estimated that the cost would now be almost $200 million!

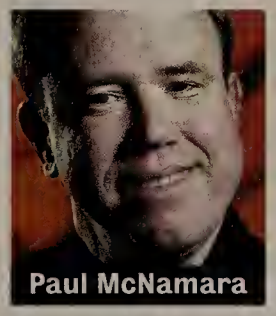
This is but a single story of the government's use of COBOL. You can bet that there are thousands of COBOL-based systems in use at both federal and state levels that desperately need overhauling. Unfortunately these projects have been put off for years, and the costs of change are going through the roof.

Here's my concern: Getting government systems away from outdated platforms is a huge undertaking, and the true costs are completely unknown. But unless we do upgrade, we're doomed to stagger on with the inefficiencies and inflexibilities of systems that are decades past their prime.

Government computing is where this country desperately needs to have a strategic focus and spend a lot of money, because the longer we put off this work, the more it will cost and the less able the government will be to address the data-processing demands of the 21st century.

Good luck, Ms. Killefer.

Gibbs is glad not to be a COBOL programmer in Ventura, Calif. Program your thoughts to backspin@gibbs.com.



NETBUZZ

News, Insights, oddities

This year's 25 geekiest 25th anniversaries

The year 1984 provided a boatload of technological achievement and geeky infamy. The media will revisit the actual anniversaries one by one over the next 12 months, but here they are today, neatly alphabetized. (A cooler slideshow version can be found at www.nwdocfinder.com 8244.)

1. AT&T disintegrates: In 1974, Uncle Sam decided AT&T was a monopoly; 10 years later, Ma Bell's empire was dismantled.

2. BETAMAX saved: The famous Supreme Court "Betamax case" was all set to go against movie watchers until Justice John Paul Stevens pulled two votes out of the fire.

3. It's a bouncing baby CISCO: Like many career couples, Len Bosack and Sandy Lerner decided their lives were incomplete without having a router company.

4. CRACKBERRY in motion: BlackBerry maker Research In Motion, which sounds like it should be the name of a geek boy band, was founded in the Canadian city of Waterloo, which sounds like it should be an ABBA song.

5. CRASHING a jet for science: Fitzhugh Fulton must have enjoyed his job of remote-control pilot as NASA conducted its "controlled" demonstration crash of a Boeing 720.

6. Neuromancer popularizes *CYBERSPACE*: William Gibson's science-fiction classic won all kinds of awards — and brought the word "cyberspace" into the lexicon.

7. Dude, you're gonna be DELL: College student Michael Dell had the idea of selling computers directly to customers, much like his classmates might peddle pot out of their dorm rooms.

8. DISCMAN takes off: Two years after mass production of CDs commenced, Sony released the first portable CD player, the Discman. It was the size of four CD cases.

9. DNA fingerprinting ABCs: British researcher Alec Jeffreys stared at a batch of X-ray film and recognized a method for putting bad guys behind bars.

10. Your ELEPHONE'S ringing: Willy Wonka's "last major invention (1984) was the Elephone, a telephone that works in an elevator," says *Wikiality, The Truthiness Encyclopedia*.

11. Future of FACEBOOK: Mark Zuckerberg was born on May 14, 1984, to Karen and Edward Zuckerberg of Boca Raton, Fla.

12. FLASH memory: Fujio Masuoka, a Toshiba researcher, invented flash memory.

13. "Who you gonna call? GHOSTBUSTERS": A staple on "funniest movies ever" lists, "Ghostbusters" opened June 8 to great reviews.

14. Bernie GOETZ: Geek with a gun: Hero? Trigger-happy racist? Whatever your view, there's no doubt Bernard ("Subway Vigilante") Goetz was a geek.

15. *2600 The HACKER Quarterly* debuts: A friend calls it "the hacker's *Home & Garden*."

16. Hi to HASSIUM: Just don't touch. A synthetic element (No. 108), it was discovered by German scientists; it's nasty stuff.

17. K250: "Isn't she lovely": That was Stevie Wonder expressing his man love for Ray Kurzweil and the Kurzweil K250, an electronic synthesizer Wonder had asked for two years before.

18. "Hello, I'm a MAC": Two days after its now-iconic TV commercial, dubbed "1984," aired during the Super Bowl, Apple's Macintosh went on sale to the public.

19. MATHCOUNTS kicks spelling-bee backside: The first national MATHCOUNTS competition was held.

20. Go NTU: National Technological University was the first accred-

See Buzz, page 38

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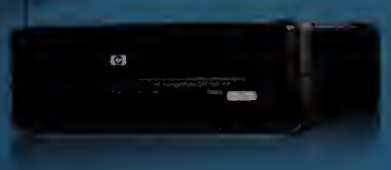

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